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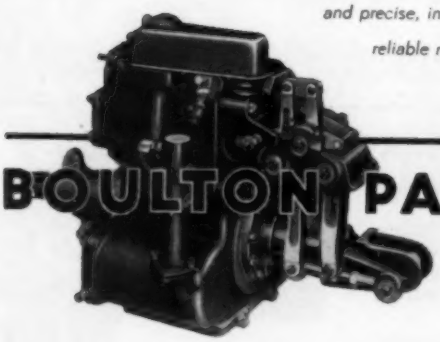

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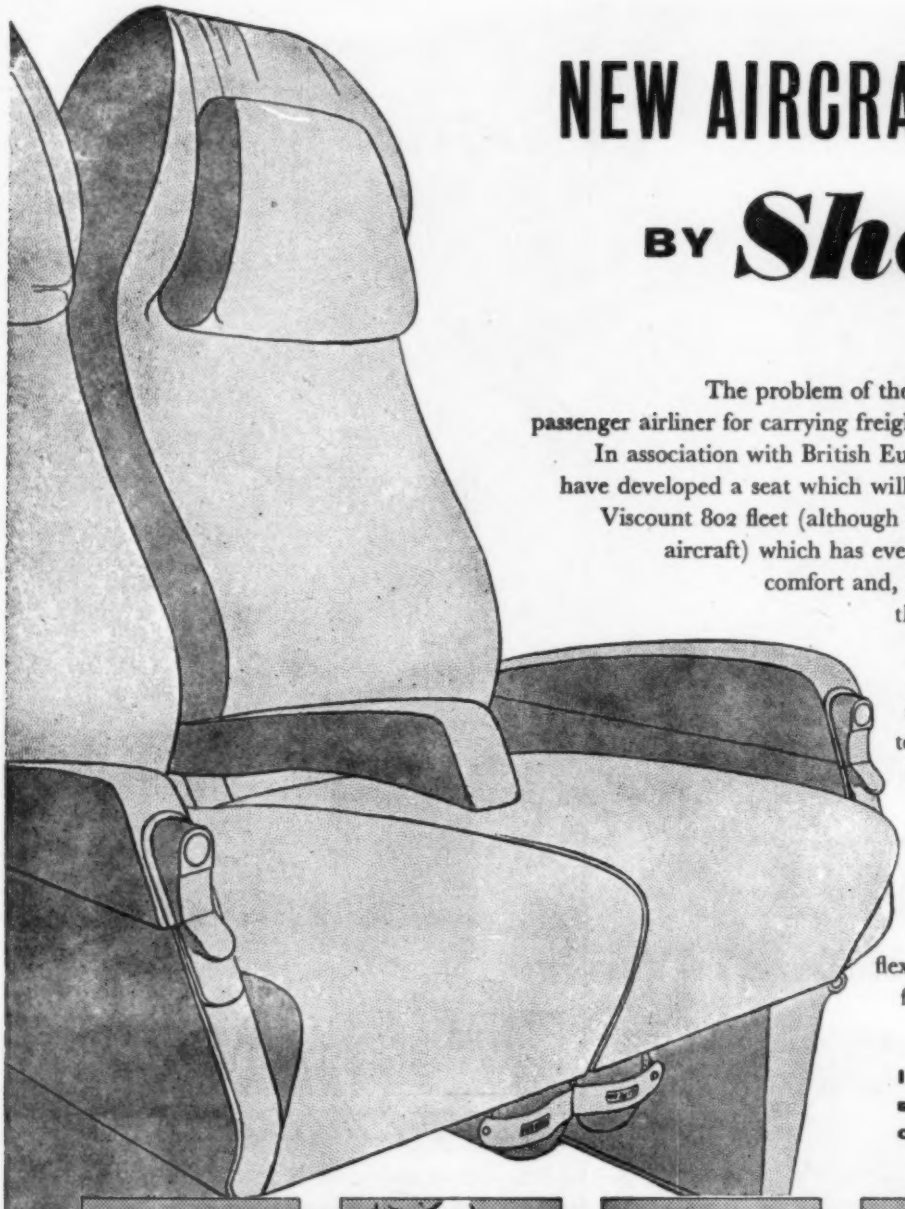

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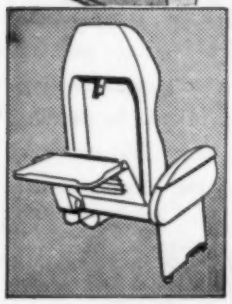

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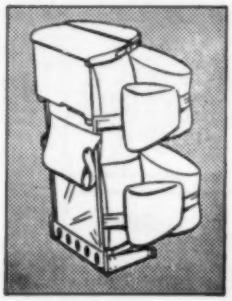

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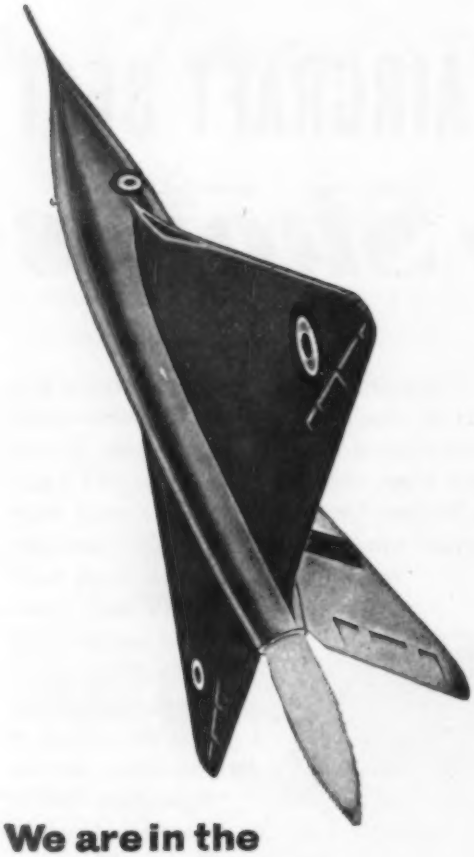

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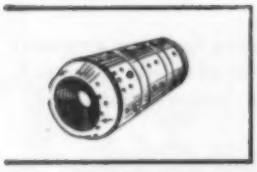

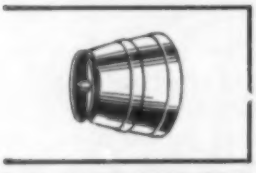

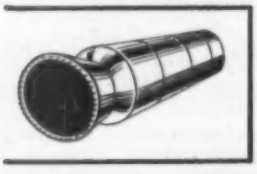

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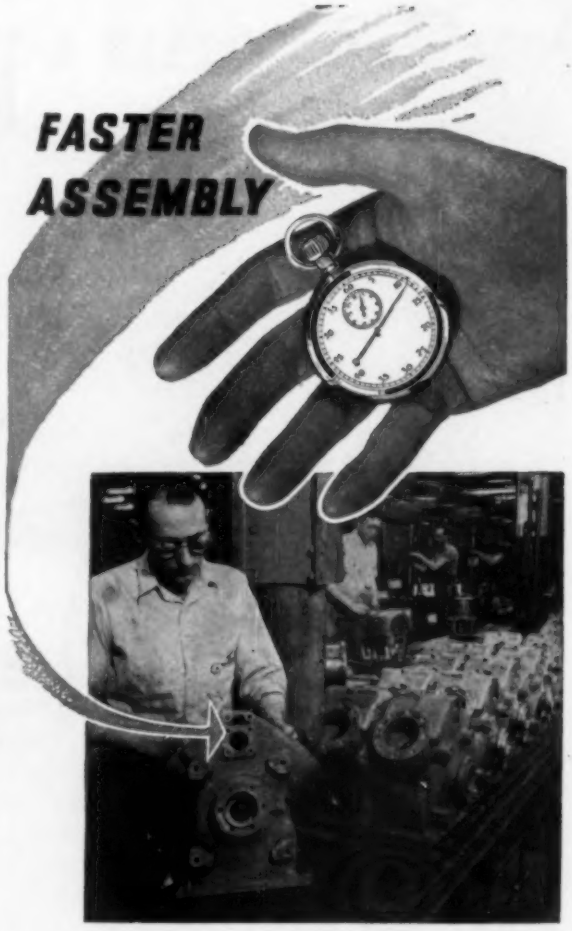

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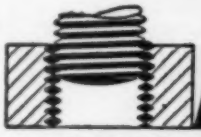

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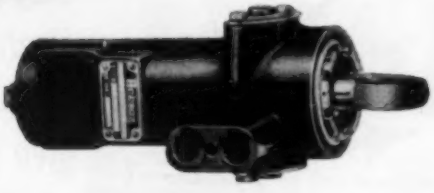

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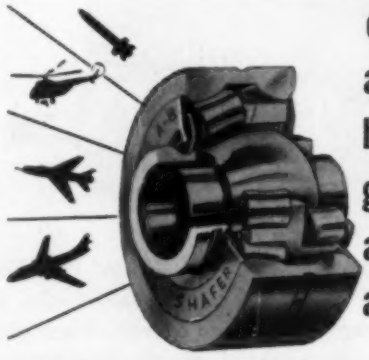

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FLIGHT
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AIRCRAFT ENGINEER

No 2477 Vol 70 FRIDAY 13 JULY 1956

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Was there ever, indeed, an aeroplane which set out on its career under such auspices as does Fokker's new transport? Small wonder that a constructional licence should have been snapped up by Fairchild of America (a company, incidentally, with an unsurpassed reputation for "productionizing" an adopted design), and that within six months of the prototype having flown the same number of airlines should have placed firm orders.

To Fokker and Fairchild, obviously, the Friendship means good business; but the promised reward of our own suppliers is not, we believe, fully appreciated. We have Fokker's own assurance that British contributions represent some 30 per cent of the Friendship's total cost, and in their view the signing of the Fairchild contract means that we should export to the hard currency area some *ten million pounds' worth* of our products. This estimate they base on a series of 150 Fairchild-built Friendships—a figure which may handsomely be exceeded if (as seems distinctly possible) the U.S. Armed Services should adopt the machine for transport duties.

While congratulating Fokker on their shrewd business sense, on an uncommonly fine aircraft, and on its early recognition by international operators, we are bound to remind them—as good friends—that they are not alone in the field. Handley Page are after them with the Herald, and Aviation Traders will soon be following with the Accountant. In the U.S.A., Mr. Jack Frye's Safari will present a challenge of its own.

Meanwhile, we rejoice in an old comradeship, a new Friendship, and a closer partnership.

— and Partnership

A SECOND transport of Continental design and construction, and one which appears hardly less promising than the Friendship, is the beauteous and capacious Caravelle of France's Société Nationale de Constructions Aéronautiques du Sud-Est. The Caravelle truly represents an *entente cordiale* in that the entire fuselage nose-section, complete with cockpit, is that of the Comet, and the twin turbojets are Rolls-Royce Avons. Moreover (as diligent readers of last week's special issue will be aware) the company was able to draw upon de Havilland's Comet experience in designing several of the systems and structural components. The equipment inventory already includes important items by Lockheed, Dunlop, Hobson, Venner, Teddington, Self-Priming Pumps, Flight Refuelling and Graviner, and if and when other engines than the Avons are demanded these may well be Conways or Olympuses.

While it should not be inferred that Britain's contribution to the efficiency and sales-appeal of foreign aircraft is restricted to the Friendship and Caravelle, these two machines undoubtedly represent a new high level of co-operative effort. In America, of course, there are parallel instances, though primarily in respect of powerplants, and those licence-built rather than imported. But the time may not be far off when remunerative shipments of British-built engines and associated accessories will begin to be made to several American aircraft plants. The Conway application in the Douglas DC-8s for Trans-Canada Air Lines may well prove to be the first swing of a strong westward tide; and though that unique by-pass engine would, of course, command the very crest of the turning wave, it might easily find itself in company with Bristol Olympuses, Rolls-Royce Tynes and Napier Elands, Oryxes and Gazelles.

FROM ALL QUARTERS

Basis for a Luftwaffe

LAST Friday, July 6, three major budgets for the future armed forces of West Germany were passed by the Bonn parliament. One of these was that for aircraft procurement, and *Wirtschaft und Sozialpolitik* reports that the table given below includes the equipment voted for, although none of the items has yet actually been ordered.

In addition to the items listed it is likely that, under a separate agreement, 380 F-100D Super Sabres will be ordered from North American Aviation; another contract not listed is that for Republic F-84Fs, for which the Weser plant were recently tooling up.

Germany: Unstated number of Nord 2501 Noratlas (a total of 137 including those made in France) costing £41.8m, built by the Weser group, Krupp and Flick; 383 Fouga Magister, £25.25m, by Messerschmitt and Heinkel; 428 Do. 27, £6.59m, Dornier; unstated number of Piaggio P.149 (with those purchased in Italy a total of 265), £3,282m, Focke-Wulf.

United Kingdom: 68 Sea Hawk, £5.105m, Hawker/Armstrong Whitworth; 83 Sycamore, £5.545m, Bristol; 33 Pembroke, £2.782m, Hunting Percival; 16 Gannet, £2.57m, Fairey; 11 Skeeter, £308,500, Saunders-Roe.

U.S.A.: 26 H-21, £6.32m, Piasecki; 26 S-58 (H-34), £4.049m, Sikorsky; 5 Albatross, £453,000, Grumman; 14 Model 47G, £390,000, Bell; 14 Model 12C, £380,000, Hiller.

Italy: 226 North American F-86K, £58.5m, Fiat; P.149 to total 265 with German production, £1.06m, Piaggio.

France: Noratlas to total 137 with German production, £4.9m, S.N.C.A.N.; 6 Djinn, £78,700, S.N.C.A.S.O.

Various: 96 flight simulators, £4.69m.

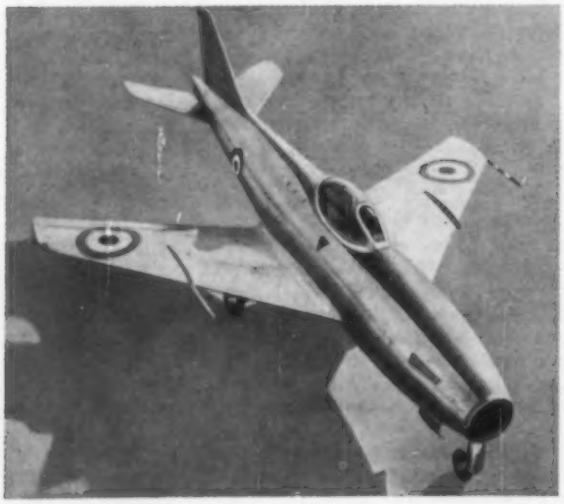
American Defence Statements

IN a report to the U.S. Senate committee on air power, Mr. Charles Wilson, Secretary of Defence, stated that the U.S.A.F. was not in any hurry to spend the additional $900,000,000 (about £321,426,000) which Congress had just voted. Production of B-52s, he continued, would not be increased beyond the present level (it is steadily rising to 20 machines per month at the moment). Mr. Wilson was speaking after Mr. Eisenhower had signed the military budget for the financial year of 1957 for a sum of $34,600,000,000 (about £12,455,000,000).

Mr. Charles Thomas, Secretary of the U.S. Navy, addressing the same committee, stated that his Service's air arm had developed a new anti-submarine weapon which would revolutionize anti-submarine warfare. Defence against submarines, he said, was receiving the Navy's highest, best and constant attention. The principal offensive weapon was the "mobile air base carrier task force." During the last year substantial progress had been made in the sound detection field as a result of which submarines could be located at much greater ranges than before. In case of war the *Forrestal* class carrier would be the principal factor in the control of the seas. The ships represented a 10,000ft runway compressed into a 1,000ft hull which could move rapidly over 70 per cent of the earth's surface without requiring agreements, paying rent or asking anyone's permission. Altogether 100 modern U.S. Navy aircraft carriers were available.

Among more specific details given were the fact that the Chance-Vought F8U Crusader had a speed of over 1,000 m.p.h. The Douglas A3D Skywarrior had a combat radius of 1,500 statute miles and could deliver high-yield nuclear weapons which could be stored aboard the carriers of the 6th Fleet in the Mediterranean and the 7th Fleet in the Western Pacific. There would be few important targets in the world which the aircraft now being introduced into service could not strike with atomic weapons. The U.S. Navy, however, had no desire to "pre-empt the strategic bombing role of the U.S.A.F."

The Talos sea-to-air missile was in production for test firing and would soon be in full production for the fleet. The Chance-Vought Regulus 1 sea-to-sea missile was fully operational from submarines and many other ships and had a 500-mile range. The Regulus 2 was faster and had a longer range. With 40 years of experience in the seaplane field, the U.S. Navy was developing a jet seaplane and a "new waterborne attack system concept." The Martin P6M SeaMaster would have excellent low and high altitude performance, could carry "megaton weapons" and could hit practically any target in the world. Aircraft of the Marine Corps now also had a "significant atomic capability," part of which was deployed in the Far East.



New French Radar Station

THE French Air Ministry gave details of a new radar station "somewhere in the Vosges mountains" with a range of 450 km (280 miles) and a "ceiling" of more than 25,000 m (82,000ft). Named *Epervier*, the station is part of France's air defence system within NATO. According to a Ministry spokesman, it will spot aircraft approaching at 560 m.p.h. 30 minutes away, while still 112 miles from France's eastern frontier. Although the site of the station has not been revealed, the spokesman said it was built 3,280ft up, within a Napoleonic fort. It had been constructed in two years and was opened six months ago.

R.34 Memorial

TO commemorate the flight of the R.34, which thirty-seven years ago today reached Pulham, Norfolk, after achieving the first east to west and the first double crossing of the Atlantic by air, the Air League of the British Empire has obtained the consent of the Minister of Transport and Civil Aviation to the erection of a memorial at London Airport.

East Lothian County Council and the responsible American authorities have also agreed to the fixing of commemorative plaques at the former East Fortune aerodrome, where the airship took off on its Atlantic voyage, and at Mineola, Long Island, where it landed in the United States.

The Air League, which is assuming the main financial responsibility for the commemoration, will welcome contributions addressed to Londonderry House, 19, Park Lane, London, W.1.

Twelve Intrepid Aerial Voyagers

A CONTEST reminiscent of much earlier (and quieter) days of aviation took place in Holland recently, when 12 passenger-carrying balloons rose from Nijmegen. They were competing for the Coupe Andries Blitz, awarded for the only international F.A.I. balloon race.

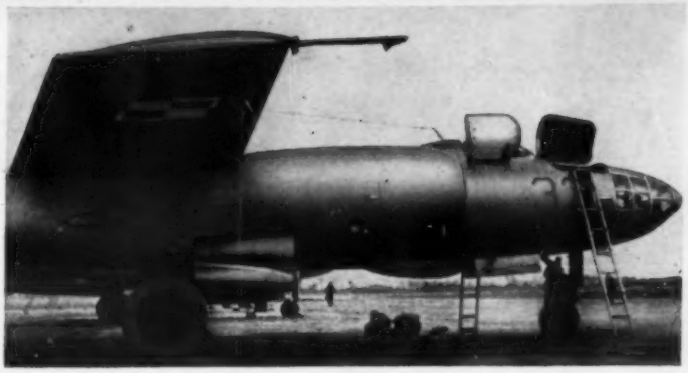
The trophy, given by M. Andries Blitz, a publisher of aviation books who died during the war, was won for the third time in succession by Mme. Nini Boesman, who thus retains it. She covered the longest distance ever achieved in one of these contests, flying on into the darkness and landing at midnight near Trier, not far from the U.S.A.F. base at Bitburg (approximately 144 miles).

Mme. Boesman, who is 37 and a well-known Dutch balloonist, was making her 112th flight. There were two other women competitors, both Belgian, 20-year-old Mlle. Andrée van Gemert and 24-year-old Mlle. Jeanne de Bast, who have each made about thirty ascents.

Oldest of these aerial voyagers from Nijmegen was M. George Cormier from France, who is 82 and has achieved over 500 flights. Other countries represented in the race, in addition to those already mentioned, were Austria, Switzerland and the Saar; and one pilot was a Turk who lives in Belgium.

Although the Coupe Andries Blitz has now been won outright, it is thought very likely that the Haagsche Balloon Club will organize another race next year, for a new trophy.

***SAGITTARIO**, precursor of Italy's Aerfer Ariete supersonic light fighter, which is to have a specially developed Rolls-Royce Derwent and a Soar or a rocket as auxiliary power.*



***IN POLISH SERVICE** is this Russian-designed-and-built Il-28 twin-jet light bomber, powered with two turbojets of Rolls-Royce Nene type.*

The Old Brigade

FROM A. Cdre. A. H. Wheeler, aviation trustee of the Shuttleworth Collection, we hear that B.B.C. television staff—including Richard Dimbleby—will shortly be visiting Old Warden (home of the Collection) to prepare a programme. This will be televised in celebration of Bleriot's Channel crossing.

The Air Commodore also informs us that a Maurice Farman Shorthorn, with a Wolseley-built Renault-type engine of 80 h.p., has been located in Australia in full flying order. The owner, Mr. F. H. Edwards, is anxious to give it a good home and is disposed to let the Shuttleworth Collection have it—in exchange for a Gemini in any condition!

A recent visitor to the Shuttleworth Collection was Lt-Cdr. Frank G. Tallman III, an American enthusiast who has built and flown a Sopwith F.1 Camel and a Curtiss JN-4 "Jenny". He is at present working on a Pfalz, a Nieuport and a Spad, but finds time nevertheless to command a U.S.N.R. helicopter squadron, flying twin-rotor Piaseckis. Cdr. Tallman has been visiting this country on behalf of the U.S.A.F. Wright Field Aircraft Historical Section, and has had some pictures of the Shuttleworth machines taken for publication in the U.S.A.

B-47 Committee Disbands

FROM Wichita, Kansas, comes news that the B-47 production committee there, which has co-ordinated the manufacture of over 1,600 B-47s for the U.S. Air Force, disbanded on June 30.

Formed in 1951 at the request of the Air Materiel Command, the committee's task has been to co-ordinate the output of the three companies—Boeing, Douglas and Lockheed—and many other firms involved in building B-47s, and to see the Air Force equipped with them as expeditiously as possible. In future it will meet only to resolve particular problems that may arise. Captain Coleman, U.S.A.F. representative and the committee's chairman, has been assigned to an Air Force missile project at Inglewood, California.

Of the other members, Ralph W. Correll (Boeing), L. C. Sebring (Douglas) and D. P. Wheeler (Lockheed), all but Wheeler, who is taking on additional duties within the Lockheed organization, will remain in Wichita to serve on the newly formed B-47 modification group.

Trans-Antarctic Otter

TRIALS of the de Havilland Otter to be used by the British Trans-Antarctic Expedition are being carried out in Canada by three R.A.F. officers, S/L. J. Lewis, S/L. R. Seymour and F/L. G. Haslop. S/L. Lewis is leader of the expedition's R.A.F. party and S/L. Seymour is senior navigational instructor at Manby. The Otter is to be used for reconnaissance and finding routes from Vahsel Bay to Ross Bay and will operate in conjunction with the expedition's Auster.

Cierva Essay Competition

THE Helicopter Association has announced details of the Cierva Memorial Prize Essay Competition for 1956. A prize is awarded annually, in commemoration of the pioneer work of Señor Juan de la Cierva, for an original essay of a technical nature on some aspect of helicopter flying. This year a £50 prize will be awarded to the competitor submitting the best paper on any subject connected with rotating-wing aircraft. Papers of purely historic or journalistic content will not be eligible, but the subject may include studies in related fields such as operation and maintenance, design and manufacture. Rules and entry form may be obtained from the Honorary Secretary, The Helicopter Association of Great Britain, 4 The Sanctuary, London, S.W.1.

***MODERN STYLING** characterizes this twin-turboprop Antonov military transport, which flew in the Tushino display on June 24. The tail armament is an uncommon feature on such a machine.*

A.R.B. Last Year

FORMAL presentation of the 19th Annual Air Registration Board report was made by Lord Brabazon during the Board's annual luncheon at the Savoy Hotel, London, on July 5. The guest of honour on this occasion was Mr. Harold Watkinson, Minister of Transport and Civil Aviation.

In the report, Lord Brabazon referred to several items which have deeply concerned the industry. The difficulties associated with the structural integrity of airframes, for example, had led to a very intensive degree of testing on the Britannia Mk 100, and the issue of a normal category C. of A. represented the culmination of the most intensive investigation every undertaken by the Board.

In view of the number of recent cases where aluminium-zinc-magnesium alloy forgings and extrusions have suffered from stress corrosion cracking, a welcome introduction will be the issue of an A.R.B. handbook analyzing structural and material defects and making recommendations for design and production techniques which should provide increased reliability in service. In particular, the Board emphasizes that the use of materials necessitating very close and rigid control is undesirable if human error is to be avoided, since past attempts to push materials or techniques to their limit have frequently resulted in unsuspected pitfalls.

The report also referred to the validation of certificates of airworthiness for aircraft designed and constructed in the U.S.A., commenting that it would be necessary for performance data to be scheduled per a British Flight Manual, and that fire-extinguishing equipment in compliance with B.C.A.R.s would have to be installed.

To further the regulation of air safety A.R.B. representatives have attended meetings of the I.C.A.O. airworthiness panel which is to draft an international airworthiness code, and a great many new requirements—including those for crew compartment design, negative acceleration, operation of essential services and emergency escape—have been promulgated in the new issue "D" of British Civil Airworthiness Requirements (Aeroplanes). Sections "E"—gliders—and "J"—electrical—of B.C.A.R. also are to be re-issued, after consultation with the British Gliding Association and the Institution of Electrical Engineers. The publication of Civil Aircraft Inspection Procedures has also been revised into a form—four volumes—in which it is hoped that maximum use can be made by interested parties. Close liaison with the A.I.D. is being maintained.

In studying the approval of equipment manufactured by accessory firms, distinction must be made between a component and an accessory, which could be passed by A.R.B. for any installation without specific reference to the aircraft types for which it is intended. The increased use of electrics and hydraulics for fundamental parts of the aeroplane has led to closer liaison between aircraft and equipment constructors, and more representative testing of equipment for specific purposes. This is welcomed by the Board as a departure from "accessory" approval against an arbitrary specification and which leaves the way clear for "component" procedure by specialist firms to supply items on the basis of their suitability for a particular use.

Proposing the Minister's health at the luncheon, Lord Brabazon said that he was unusual in being a technical man and was thus singularly fitted to hold his present office. He went on to refer to the continued friendly relationship between the Board and the Ministries, and to pay a tribute to the Ministers and civil servants. He also paid a tribute to the Board's treasurer, Mr. J. I. Taylor, adding that the A.R.B. no longer had a deficit. Both in his speech and in his printed report, Lord Brabazon referred to the complex and urgent problem facing the Board over the investigation of the structural integrity of aircraft.

Lord Brabazon next turned to observations on jet airliners. He said that the British aircraft industry had pioneered the jet airliner and knew more than anyone else about them today. It had

ALL QUARTERS...

never been pretended that they were economical. He said that the big new jets had been ordered by many operators who did not really want them, and asked, did anyone realize what they meant in terms of taxpayers' money, for longer runways, strengthened runways, and in terms of noise, right of way on approach and right to refuse stacking. Lord Brabazon said that he believed that all aircraft which touched down at over 100 m.p.h. were in danger.

The economics of the new jets were very questionable except at abnormally high load factors, he continued. The world screamed today about the jets to come, but made all too little of the turbo-props which we had today. Flying was not just New York to London and San Francisco; there were many other routes. He asked are we going to be stampeded into jets of American type? Or should we give proper attention to fuel economy, silence, reverse thrust, deflected thrust, lower landing speeds and shorter landings, and to a concentrated attack on laminar flow?

The concentration on speed had been overdone. Passengers were more interested in regularity, safety and comfort, and Lord Brabazon thought that there was an enormous future in an Air Passengers' Protection League! Lord Brabazon then introduced Mr. Watkinson, who was to reply, saying that it seemed that at present we were just drifting. Would the Minister tell us something of what we were intending to do?

In his reply, Mr. Watkinson said that we must try to hold a leading place in the air as we had done at sea.

We have remarked in past years of speeches by Major R. H. Thornton that it is impossible to transpose them into the printed word. Once again, Major Thornton delighted and entertained everyone in proposing the Guests.

The response was made by Mr. George Edwards, who started by paying a tribute to Lord Brabazon for his services to the A.R.B. and British aviation. He also spoke warmly of the work of the chief technical officer and chief test pilot. He added that the people concerned in his company considered Taffy Davis to be "one of the best performers in an aeroplane." Mr. Edwards spoke of the independence of the A.R.B. and added, somewhat cryptically, that more independence elsewhere might produce the same happy results. Of the big American jet airliners, he said that competitive, noisy or not, they had sterilized a great whack of money in America, and we should never underestimate American competition. He referred to his recent visit to Russia as a member of a Government mission, and said that, in addition to America, we should soon have Russia in competition with us. Like America, but unlike ourselves, they had a large home market and adequate facilities. They would be flying three new civil prototypes in the year to come. He hoped for our sake that they had licensing authorities to hold them back a bit! Certainly, it would not be many years before we were in competition with the Russians and they were, in his opinion, pretty competent people.

Mr. Edwards went on to refer to American competition on long-range routes and the 200 aircraft "which had been bought mainly with the money that the customers had not got." B.O.A.C. wanted 20 or 30 aircraft at the most, and on this basis we could not afford to compete. The only chance for British manufacturers now was to do something different which would take ten to twelve years—a supersonic airliner, in fact.

America and Russia had a way of not starting something until they knew they wanted it, he added. They believed in the sustained policy. One aircraft that Mr. Edwards could think of had cost three-quarters of a million precious design man-hours, which had gone down the drain without any reward. This we could not afford.

After referring to the Viscount, Mr. Edwards said that he thought it was right to buy British aircraft, not because they were British, but because they were the right aircraft, and he here mentioned the excellent job that had been done by engine manufacturers, Rolls-Royce in particular.

SCORPION and SCREAMER

ROCKET motors developed by the British aircraft industry invariably seem to have a name beginning with the letter S, and in the case of the two units described here the names are as dramatic as the units themselves. Both are liquid-propellant, single-chamber motors intended for permanent installation in manned aircraft.

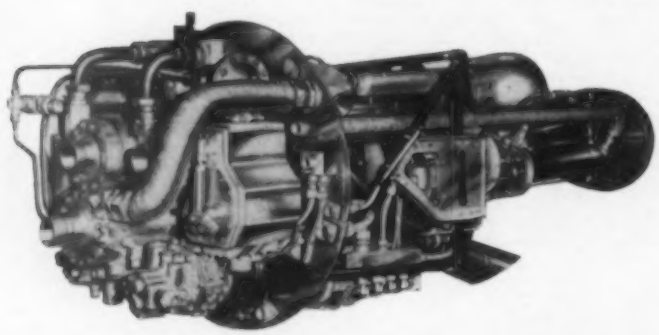
The Scorpion is a Napier unit (Ministry of Supply experimental rating NSc.1) designed at the company's Flight Development Establishment at Luton, Beds. No details of the Scorpion may at present be published, but, from the accompanying photograph of its installation in an English Electric Canberra, one can make certain obvious deductions regarding its general character. The motor is installed in the rear part of the bomb bay, together with its associated tankage and control systems. The complete installation was manufactured and installed by Napier at Luton, and the Scorpion was first fired in the air on May 20. Development has since been most satisfactory.

The other motor depicted on this page is the Armstrong Siddeley Screamer. The existence of this unit has long been known, but only now is it possible to describe its basic characteristics; a full description will follow in an early issue. Rocket development by Armstrong Siddeley Motors is concentrated at an *ad hoc* establishment at Ansty, near Coventry. Using as a basis the experience gained during the bench- and flight-trials of the Snarler (the first British liquid-propellant motor to fly), the design of the Screamer was started several years ago and the prototype Screamer was first fired at Ansty in March 1954.

Flight development of the Napier Scorpion liquid-propellant rocket motor is being undertaken with a unit mounted in this English Electric Canberra. The horizontal pipe under the extreme tail is an overboard-dump-pipe for propellants. Shock-diamonds in the jet can be seen.

Although other mixtures are obviously suitable, the Screamer was designed to run on liquid oxygen and kerosine, and the initial special-category test rating was 4,000 lb thrust on the bench. During the development of the Screamer the thrust was progressively raised to 8,000 lb and present examples can develop as much as 9,500 lb-thrust at 40,000ft altitude (very much more than the thrust of the world's most powerful turbojet at this altitude).

The accompanying photograph shows the very neat installation which Armstrong Siddeley have evolved. In their previous unit, the Snarler, an external mechanical drive had to be provided for the propellant pump, but in the Screamer the complete installation is self-contained and could, if necessary, be used as the sole powerplant of a high-speed aircraft. The pump valve and control group occupies the left hand of the photograph and the regeneratively-cooled chamber is visible at the extreme right. The circular firewall indicates that this particular motor was designed to fit in a small nacelle. A single lever is employed for starting, control of thrust and shut-down.



This version of the 8,000 lb-thrust Armstrong Siddeley Screamer weighs 470 lb, and measures 78in in length by 28in diameter.

VALIANT SILENCER

AT the Anglo-American Conference last year Mr. E. S. Allwright, deputy assistant chief designer of Vickers-Armstrongs (Aircraft), startled delegates by projecting a slide of the strange device illustrated here. It was the first public showing of the silencing equipment which his company has developed to muffle the blast of the Valiant medium bomber (four Rolls-Royce Avon).

Since that time there have been several development problems, but the equipment has been in full use since February and is now quite trouble-free.

Gas-turbine-powered aircraft do not usually have to do much ground running except during the testing and calibration stage at the start of their life. The Valiant starts life at Weybridge, Surrey, in the centre of what was once Brooklands motor-racing track. Within the periphery of the old track site the whole space is now almost filled by design offices, production plants and other typical ramifications of a great aircraft company, with room in the centre for what must surely be the tiniest large-jet-bomber airfield in the world (out of which the newly built Valiants have to fly). The inevitable result is that opening up the quartet of five-figure-thrust Avons used to cause quite a lot of distraction to most of the Weybridge staff, and also threatened to impair the company's good relations with the residents of a heavily populated surrounding district. It was a problem which had to be solved in good time.

In 1954 it was decided to build silencing equipment. Owing to the size of the Valiant a static pen would have been impracticable and accordingly a portable silencer—necessarily of awesome dimensions—was evolved. The unit comprises paired circular intakes, a common conical diffuser and a final splitter box in which most of the muffling takes place. The splitter box is 15ft in length and contains conventional splitters, six inches thick, filled with sound-absorbent material. The whole unit is pivoted hydraulically about vertical and transverse axes to a girder chassis fitted with aircraft-type wheels, with hydraulic brakes to hold the unit against the end-load caused by the gas flow.

Owing to the different heights of the Valiant's inboard and outboard engines (see photograph above) there are separate left- and right-hand silencers, which are towed into position by a tractor before any ground-running takes place. Measurements taken by the National Physical Laboratory show that at a distance of 100yd the silencers cut the noise to the rear of the Valiant by some 20 db at maximum power; this is roughly the same as the noise level at the front caused by the main engine intakes. It is fair to state that Valiant running now causes no disturbance to anyone not in the immediate vicinity of the aircraft.

As far as can be ascertained, this is the first portable silencer for large jet aircraft yet to go into use anywhere in the world. The design was carried out by Vickers-Armstrongs and the manufacture was entrusted to the Elswick (Tyneside) works of Vickers-Armstrongs (Engineers), Ltd. Cooling is effected solely by the airflow induced by the jets from the twin Rolls-Royce Avon turbojets.

HERE AND THERE

Russians for Farnborough ?

HAVING considered an approach by the Government, the Society of British Aircraft Constructors has agreed to issue to Russian representatives a limited number of invitations to the 17th Flying Display and Exhibition, to be held at Farnborough from September 3-9.

Soviet Model Aircraft Entry

FOR the first time, the Soviet Union has entered a team in the world championship contests for power-driven model aircraft which are being held at the College of Aeronautics, Cranfield, Beds, on August 6. Czechoslovakia will also compete, and contestants have entered from over twenty countries. The championships are for a single class of model, built to an international specification, with an engine not exceeding 2.5 c.c.

Anti-submarine "Device"

LATE last month the Ryan company of San Diego announced receipt of a U.S. Navy contract for the AN/APN-97 (XN-2). This designation cloaks an electronic device which will facilitate the detection of submarines by hovering helicopters; it provides electrical output signals for "more fully automatic operation of helicopters." Transistorized circuits have resulted in the weight being very low. An earlier version has been fully developed and the new XN-2 will be delivered this summer.

Single-stage Rocket Record

ON July 9 the U.S. Navy claimed a new altitude record for single-stage rocket vehicles. The new figure is 163 miles (over 860,000ft) and it was achieved by an Aerobee-Hi (Aerojet-General) launched from White Sands, New Mexico, beating the Viking (Martin) figure by five miles. Previously the Aerobee-Hi vehicles had failed to approach design performance, which is 190 miles. It could be argued that the Aerobee-Hi is two-stage since a booster is employed, dropping off after 3 sec. These vehicles will be used during the International Geophysical year 1957-58.

STARTER'S ORDERS: Tests were recently held at Boscombe Down on the Fairey Delta 2 to see if small Venner silver-zinc accumulators would be capable of starting the Rolls-Royce Avon. A 120 volt 40 a-h silver zinc battery for starting, plus a 28 volt section for electrical services, were assembled in a container, which was in turn connected to a standard Rotax starter panel. The lightweight battery started the engine without difficulty on all attempts.

Eland Type-test

NAPIER announce that their Eland turboprop has successfully passed the Ministry of Supply 150-hour type test at a rating (NEl.1) of 3,060 e.h.p. Considerably higher ratings are expected to be similarly proved over the forthcoming months.

F-86s for Pakistan

IT is reported from Karachi that the first shipment of F-86s for the Pakistan Air Force has arrived aboard a United States aircraft carrier. The aircraft form part of the current U.S. 170,000,000 dollar (£60m) military aid programme for Pakistan.

Australian Titanium Mining

TITANIUM, needed by the British and American aircraft industries, is to be mined in large quantities from Bathurst Island, 40 miles north of Darwin. This was stated by Sir Claude Auchinleck, who is chairman of Dowsett Holdings, Ltd., which has leases on the island, on his arrival in London from Sydney last week. Work is expected to be in full swing in a year or 18 months' time.

Aviation Artists Exhibition

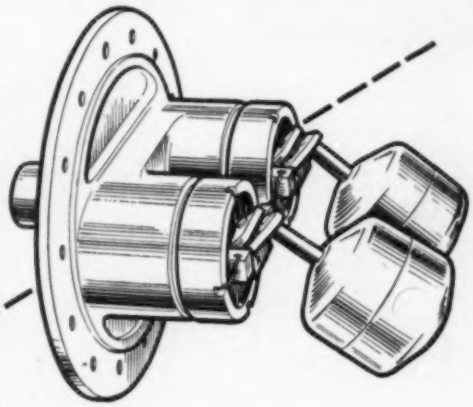
THE third annual exhibition of the Society of Aviation Artists is to be held at the Guildhall Art Gallery, London, E.C.2, during September. Receiving day will be Monday, September 3, and applications for further particulars should be made to The Secretary, The Society of Aviation Artists, 23 Albemarle Street, London, W.1, together with a stamped addressed envelope.

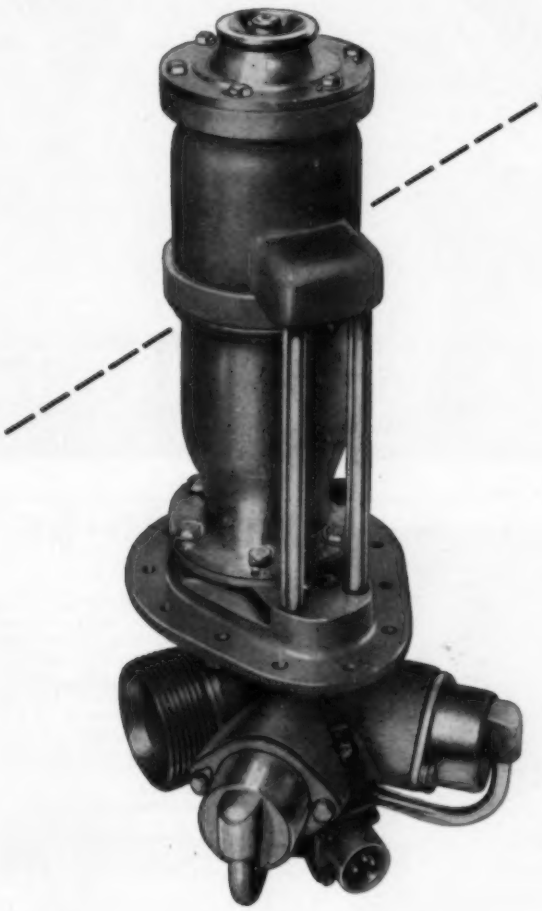
G/C. F. H. Kirby, V.C.

WE regret to record the death, at the age of 84, of G/C. F. H. Kirby, V.C., C.B.E., D.C.M. He served throughout the South African War, during which he won both the V.C. and the D.C.M., and in 1912, after twenty years in the Army, joined the R.F.C. and again distinguished himself in France during the First World War. He retired in 1926.

OUT IN THE SUN: left, Sir Frank Spriggs, group managing director, opens the Hawker Siddeley Group sports at Slough, Bucks, on June 23. On his right are Mr. H. G. Herrington, managing director of High Duty Alloys (hosts for the occasion), Mrs. Herrington and Lady Spriggs. Right, during Flying Training Command's garden party at Shinfield Park, near Reading, on June 30, the A.O.C.-in-C., Air Marshal R. L. R. Atcherley (due to receive the accolade of knighthood from the Queen last Tuesday) puts a point to Air Chief Marshal Sir Francis Fogarty (centre) and A.V-M. G. R. Beamish (left).

Double valves supply the answer





Adequate venting for high rates of flow is always a problem. It may be desirable perhaps for structural reasons to achieve protection by double shut-off valves as opposed to adequate venting. In such cases the double shut-off feature of the F-R Mk. 32 Refuelling Valve provides a solution. This component comprises two valves operated independently by the two-level float switch illustrated. If either the primary valve or its associated float switch should become unserviceable the secondary valve and float switch will operate.

MK. 32 DOUBLE REFUELLING VALVE
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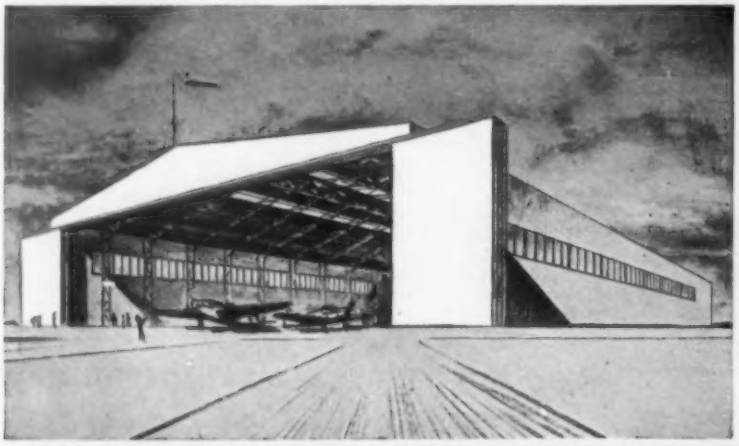

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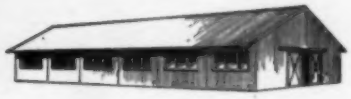

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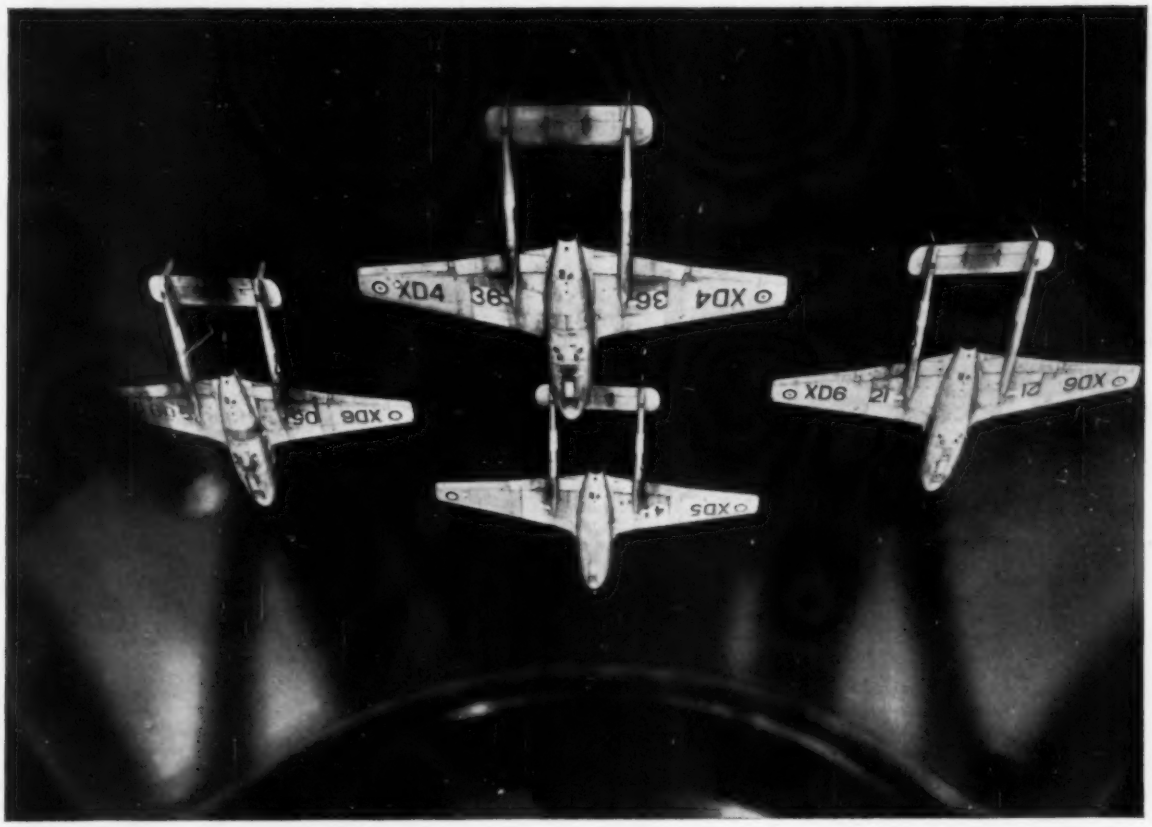
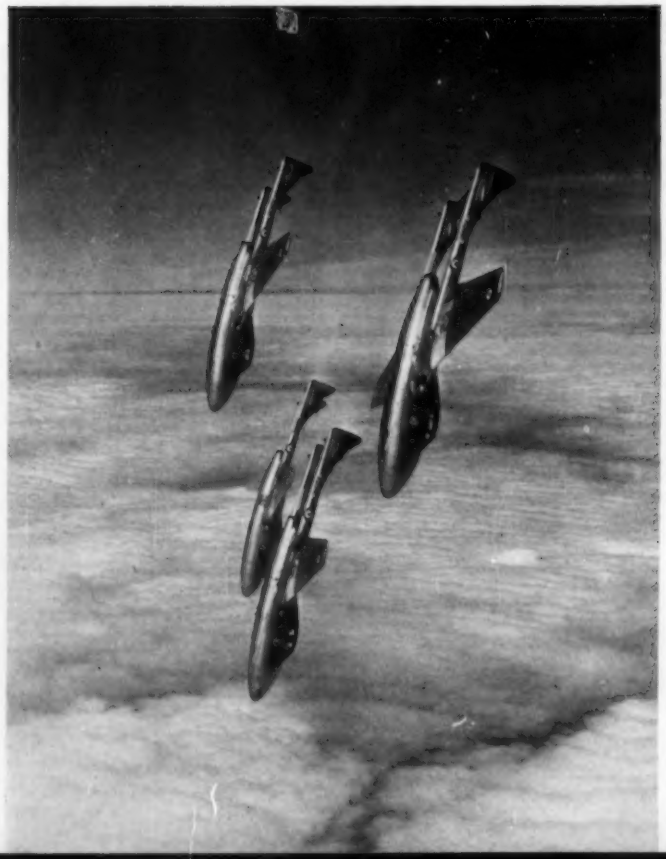


End-of-Course Get-Together at C.F.S

AROUND graduation time the skilled and fortunate ones who take the Central Flying School course have various methods of expressing their high spirits. Course 177 went a step further than most, for four members—as seen on this page—put on some first-class formation aerobatics in their de Havilland Vampire T.11s. A framed enlargement of the picture on the right (taken from a Meteor 7 flown by F/L. D. Franklin, an instructor) has been presented to the mess by members of the course. Below are the four pilots concerned: (Back, left to right) F/L. I. Johnston (ex-79 Sqn.) and F/O. R. Woodhouse (ex-6 Sqn.); (front) F/L. D. Samuels (ex-263 Sqn.) and F/L. P. Swoffer (ex-54 Sqn.).



Flight-testing the Pasotti Airone F.6

Thoughts on Airscrew Suitability
A Jet Version in Prospect

By VICO ROSASPINA

THESE notes were contributed by the Italian test pilot who carried out the test flight programme of the prototype Pasotti Airone F.6. He was also responsible for flight testing the first production aircraft which, as he relates below, is fitted with slightly more powerful engines and variable-pitch, feathering airscrews.

THE Pasotti Airone F.6, designed by Stelio Frati and built by the Pasotti factory at Brescia, is a four-seat, twin-engined touring aircraft, strongly built, equipped with a retractable nosewheel undercarriage and having a high cruising speed and considerable range. The prototype, which is the subject of this report, and which I myself tested, is equipped with two Continental C90 engines of 90 h.p. each, fitted with fixed-pitch, wooden airscrews. Production aircraft, which are now being delivered, have two Walter Minor IVs of 105 h.p. each, with variable-pitch, feathering airscrews. More powerful American engines had been foreseen, but it was not possible to obtain the variable-pitch airscrews for them. Such airscrews are considered vital for a small twin—and even for a fast single-engined aircraft. With the two 105 h.p. engines with v.p. airscrews, full power is available at take-off, in the climb and during single-engined flight, so that the maximum weight, cruising speed (161 m.p.h. with the Walter engines) and fuel consumption will be balanced to the best advantage. On one engine the full power of the operating engine will be available and the drag of a windmilling airscrew will be avoided.

By contrast, with fixed-pitch airscrews the full power of the engine may only be available at maximum speed in level flight, and the very minor advantages these could offer over engines of lesser power with v.p. airscrews would be a slightly higher maximum and cruising speed. If a 140 h.p. engine, for example, is fitted with a fixed-pitch airscrew, the pitch may be calculated to give the maximum r.p.m., and therefore the maximum power, only in level full-speed flight. In this case, at take-off speed, power proportional to the maximum speed will be lost because if engine and airscrew are set to give 2,600 r.p.m. in level flight at 185 m.p.h., at take-off certainly no more than 2,000 r.p.m. would be available; and this, according to the power curves, will reduce the maximum 140 h.p. to 100 h.p. or even less. In a full-throttle climb a similar loss of power would occur. Moreover, there would be an additional loss in the aircraft's aerodynamic efficiency because, with fixed-pitch airscrews, the optimum aerodynamic climbing speed usually has to be increased by five or ten per cent in order to make available more r.p.m. and therefore more power.

These arguments hold good either for twin- or for single-engined aircraft capable of more than about 140 m.p.h.; and the disadvantages of the fixed-pitch airscrew can be translated, in proportion to the difference between take-off and maximum speeds, into a reduction of payload capacity, because this, too, directly affects take-off and climb.

For a twin, however, there is in addition the question of single-engined flight. In this case we find not only a reduction in power of the working engine caused by the fact that the resulting reduction in airspeed forces r.p.m. down, but also that a good proportion of the remaining power has to be used to overcome the drag of the windmilling airscrew. It can be concluded, therefore, that an aircraft equipped with 140 h.p. engines and fixed-pitch airscrews might well have the disadvantage, in comparison with a powerplant of 105 h.p. engines and v.p. airscrews, of producing the same or less power in just those flight conditions where maximum power is most important, i.e., during take-off, climb and single-engined flight. The fixed-pitch installation will have a higher fuel consumption: the aircraft will have to carry a higher fuel load either in order to obtain the same range or to allow for the higher weight of the more powerful engines.

This has proved a very important problem, especially when, as at present, higher and higher speeds are being achieved with comparatively low-powered engines. The Airone is one of many cases in point.

As mentioned above, for want of v.p. airscrews, the Airone prototype was fitted with two Continental 90-h.p. engines with wooden fixed-pitch airscrews. The passenger cabin is comfortable and visibility in all directions is very good; lap straps are provided for the passengers. Control-column movement is unobstructed and the throttles, carburettor heating controls, mixture levers and fuel cocks are arranged below the instrument panel between the two pilots and well within their reach. For take-off all levers have to be set upright.

On the left-hand side of the panel in front of the first pilot are the undercarriage and flap controls, master-switch, parking brake, engine instruments and hydraulic gauges. Centrally disposed is the blind-flying panel with, from left to right, A.S.I., artificial horizon and V.S.I., and below them the ball-and-needle slip indicator, gyro D.I. and altimeter. On the right of the panel are the V.H.F. controller; radio compass; and switches controlling generator, battery, radios, cabin, navigation and landing lights and pitot-head heater. On the floor between the two pilots are the two starters, undercarriage emergency lowering control and fire extinguisher actuators. Beside each pilot's feet are inlets for hot and cold air. The independent hydraulic mainwheel brakes are toe-pedal operated and flaps are hydraulically set to any position between 0 and 60 deg, with an indicator on the left. Magneto switches and elevator and rudder trim wheels are in the cabin roof. Ventilation is independently controlled for the front and back seats.

Folding tables are mounted in the backs of the front seats, together with small lockers, and a baggage compartment is accessible either from inside the cabin or from outside. A number of accessories such as ash trays are also available. Smoking in the cabin is permitted since no fuel lines pass nearby. In the production Airone all fuel will be carried in permanently attached tip tanks, but in the prototype tanks are in the wings, and high up in the

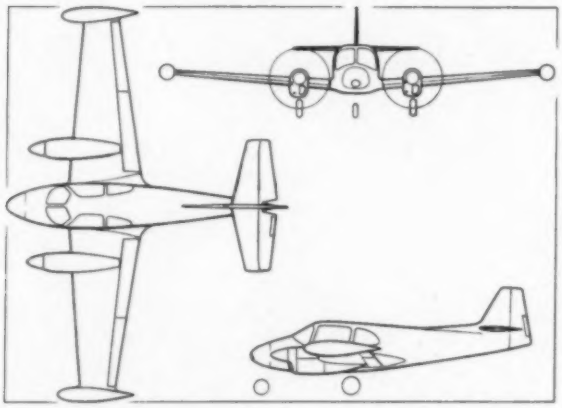
Comfortable, and offering an excellent field of view, the cockpit of the Airone is shown below to be treated in modern style. The layout is described in the text immediately above.

The photograph on the right shows the prototype Airone, and the three-view drawing (below) is of the production version.

tail of the engine nacelles to ensure gravity feed in case of failure of both the engine-driven fuel pump and of its electric stand-by. The Airone's range is 740 miles.

The undercarriage gives a very smooth ride during taxying and the aircraft rolls straight, but is easy to turn using either engine or brakes. The latter are extremely effective and will hold the full power of either or both engines during run-up. The Airone will take-off entirely by itself and I normally demonstrate this by opening up to full power, removing feet and hands from the controls and leaving it to take off alone. This is rarely possible in a twin. The prototype unsticks at about 68 m.p.h. at full load, even without flaps, but the production version uses less runway. The prototype climbs on full power at about 93 m.p.h. and 880-980 ft/min. With the Walter engines this will be improved to 82 to 90 m.p.h. and 1,176 ft/min at full load. Trimmed for cruising, the speed settles down to between 136 and 142 m.p.h.

If displaced laterally from the trimmed condition, with the controls either free or fixed, the aircraft rapidly recovers the level



attitude. In a spiral, with engines synchronized, the controls can be released and it re-establishes itself slowly with the slip indicator central, from either left or right; the only difference lies in a slight tendency to climb or dive according to the direction of the turn. I shall not describe the dynamic and static stability tests nor those for manœuvrability with controls free or fixed or the design and development of the controls. The results are excellent, as all pilots who have tested the machine according to officially recognized techniques agree.

The Airone gives ample warning of the stall and in all conditions of c.g. and position of flaps and undercarriage it stalls perfectly straight with aileron control remaining. On one engine it continues safe and responsive; and a turn towards the dead engine can be executed in comfort. It is even possible in this condition to let go of the stick without the slightest trouble. With one engine stopped and the other at maximum power, and with the asymmetric condition held on the rudder, the Airone stalls straight and holds its heading to the last moment.

If power is reduced and the undercarriage lowered there is a nose-down tendency which is easily trimmed out to give a "hands-off" glide at 93 m.p.h. and 395 ft/min. When flaps are lowered the nose-down tendency increases but can again be easily trimmed out. The rate of descent reaches 1,176 ft/min at 84 m.p.h. when 60 deg of flap is lowered. A wide range of rates of descent makes precision approaches easy even for a pilot of limited experience. Elevator movement is sufficient to make a landing at a pronounced angle of attack with the c.g. fully forward, and the landing run at full load can be limited to 395ft without excessive use of brakes.

It is noteworthy that on the round-out at about 62 m.p.h. the aircraft can be held precisely straight with rudder even if one engine is opened up to full power. Control can be maintained under these conditions until after touch-down. Although it would be sufficient if full asymmetric power could be held down to 130 per cent of the stalling speed, in this aircraft it can be maintained down to 90 per cent of it.

The Airone is small and easy to maintain and could be entrusted even to inexperienced pilots. After three circuits a pilot with only 100 hr experience, none of it on twins, could manage it. It has all the advantages of a twin without any of its drawbacks of complication and handling.

By virtue of the Airone's robustness, Stelio Frati has already produced definite designs for a jet-propelled version powered by two Turboméca Palas. The only structural modification would be the use of a slightly thicker plywood skin on the wing which would bring the maximum permissible diving speed up to 340 m.p.h. Mr. Frati of course already has the Palas-powered Caproni F.5 design to his credit. Since the Airone has no pressure cabin it would probably cruise at 13,000ft to 16,400ft using one engine only. With a pressurized cabin it would of course be faster and more economical to cruise at higher altitudes.

ELSTREE AT HOME

WITH sonic bangs and high-speed aircraft occupying the lion's share of today's air display market, Elstree Flying Club decided not to invite any Service participation for their recent At Home. The main purpose of the meeting was to show the club in action and to convince the man in the street that flying as a hobby is there for anyone who cares to come and taste it. For this reason the gates opened over an hour before the start, and people were able to step into an Auster Autocrat and Hawk Trainer that were parked on static display, while the Link trainer was kept fully occupied.

At 3 p.m. six aircraft took off to take their places in an opening formation. Led by Bill Bailey in the school Gemini G-AJTL, the remaining positions were held respectively by Whitney Straight G-AFGK, Tiger Moth G-ANSH, Comper Swift G-ABUS, Hawk Trainer G-AJJI and Auster Autocrat G-AGXT. One run across the field and a break left the stage to the Tiger, C. A. Nepean Bishop up, whose aerobatics were as polished as always.

The Gemini and the Swift then made two runs for the crowd to estimate their differences in height, after which G-ABUS performed for a short while before swopping the purr of its Pobjoy for the silence of a sailplane—an Olympia flown by George Scarborough from the London Gliding Club, Dunstable.

By this time the rotors of an Agusta-Bell 47 from Derby were whirling in readiness for some helicopterics by Tim Clutterbuck, during whose performance J. Hoffman from Abingdon made a delayed drop from an Auster.

The competing aircraft for the next event had been handicapped round the course and lots were then drawn for machines, so an excitingly close finish was expected. First away was Audrey Windle in G-AKKR, but the similarity in speeds was such that the fourth Hawk was away only 24 sec later. During the last of three laps of the five-mile circuit Bill Bailey, second away, managed to overhaul the starter and crossed the line in the lead, though it was a close finish.

Immediately after completing the course the four Maggies climbed away and joined up to appear from the south in box formation, but while they were getting together Auster Autocrat G-AGXT staggered skywards trailing a banner to declare "I am Ten Today." The box then peeled off in a "feathers" break before XT re-appeared for a run across the field.

Ranald Porteous, in Auster's demonstration Aiglet, concluded the display with his usual impeccable demonstration of Aigletics.

To celebrate Autocrat XT's ten years at Elstree, during which it had logged 5,000 hours, an over-size birthday cake was cut, a bottle of champagne consumed and the Autocrat's airscrew adorned with a bouquet by a French television actress.

Hunting Geophysics, Ltd., Dakota, decked like a Christmas tree with masts and coils for its E.M. equipment. The boom at the tail carries the magnetometer head and the "bird" is carried in a crutch under the fuselage.

Hunting Geophysics, Ltd., Geological Survey Dakota

Three-fold Air Survey

MAGNETOMETERS and electro-magnetic detection devices are now fairly extensively used from the air in the search for mineral deposits, particularly in Canada and by British companies. Three instruments are mainly used in this work, namely, the magnetometer which measures the magnetic field distribution and which was used to some extent during the war for detecting submarines; the scintillometer, with which radio activity emanating from the ground can be measured; and the electro-magnetic detector, known as E.M., which is new to England.

The best results in prospecting from the air can be obtained by combining all these three systems in one aircraft, using a camera to record the ground position over which the readings from the various instruments have been taken. Hunting Geophysics, Ltd., have now completed trials with their Dakota G-AMYW in which, for the first time in Europe, all three instruments have been installed together. The conversion was completed a few months ago and, after the A.R.B. airworthiness trials had been carried out, the aircraft was sent for three weeks to the Isle of Man and North Wales to check the performance of the equipment over known ore deposits. The results proved satisfactory and the aircraft will fly to Spain and Africa for further demonstrations and work.

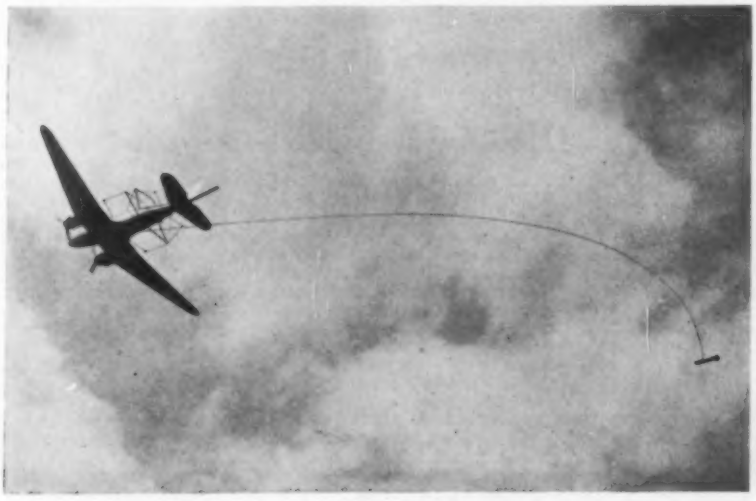
The basic airframe is a C-47 which has been adapted to carry a fixed-head magnetometer projecting on a 12ft-long boom from the tail cone, a large coil with its axis horizontal rigged on masts above the fuselage and another coil, with its axis vertical, mounted on further outriggers level with the cabin floor. The coil above the fuselage has de-gaussing functions which are intended to cancel out the effect of the airframe on the E.M. equipment. The lower coil sets up a magnetic field and the secondary field returned by ore beds below the ground are detected by a coil trailed on a long cable some 200ft below the aircraft. An electric winch lowers this detector coil, which is housed in a plastic "bird," from a padded crutch underneath the fuselage centre section. The scintillometer is mounted inside the fuselage and is not apparent from outside. Finally, a vertical 35 mm ciné camera looking through a window under the cabin takes pictures at given intervals of the ground over which the aircraft flies.

The E.M. equipment can send its pulses 300ft down into the ground from the primary coil, and the detector in the "bird" will pick up the returning signals from various types of ore or ground features. The scintillometer can detect 35-millionths of an ounce of radium from a height of 200ft while travelling at 150 m.p.h. For the E.M. survey a high A.C. current is passed through the primary coil and produces a magnetic field. Two frequencies are best used and 2,200 c.p.s. and 400 c.p.s. have been found most suitable. The response of various conductors varies with the frequency of the energizing field and the use of the two frequencies allows the geologist to draw useful conclusions as to the relative conductivity of the deposit. As the high-frequency field does not penetrate as deeply into the earth as the low frequency, the plot of the former will show up surface conductors such as lakes and swamps. The low-frequency plot will also give indications of these but it will show stronger anomalies (indicating ore bodies) over deeper and potentially more valuable areas of conductivity. The ratio between the high- and low-frequency response figures forms the basis for interpretation. The conclusions can be checked with indications of the other equipment and finally the whole is produced in maps, and the nature of deposits can be judged.

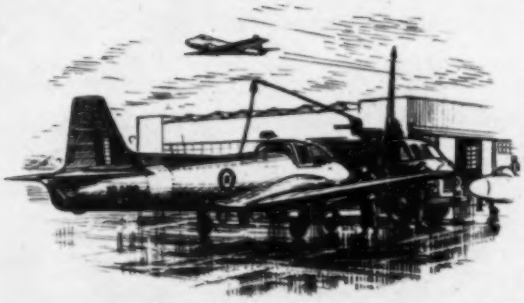
A particular advantage of the Hunting multiple installation is that it can be used to gain in a matter of days enough information to keep the interpretation teams busy for months; and certainly as much information as a ground survey party would have gained in many wearisome months. The work of the ground parties is naturally by no means eliminated, but their most profitable areas for investigation are readily indicated by the aerial work.

The Hunting survey Dakota carries a crew of four or five consisting of a pilot, co-pilot/navigator, two technicians to operate the equipment and often a ground engineer. The last-named is important since it is essential that the aircraft be kept airworthy throughout a given assignment. It is normal to fly over the specified area in a series of straight lines placed at right-angles to the most likely axis of ore deposits, the lines being spaced one-eighth of a mile apart. Extremely precise flying is required since the lines must be flown to an accuracy of ± 73yd and within ± 50ft of 500ft above ground. Using very large-scale maps and specially developed drift and heading indicator, the navigator guides the pilot along the desired flight line and the required ground clearance is maintained with the aid of a radio altimeter.

(Below) The special Dakota G-AMYW trailing its E.M. sensing coil 200ft below and behind. The coil is housed in a plastic "bird," shaped and finned like a bomb. (Right) The interior of the aircraft showing the technicians at their posts. In the foreground the "bird" winch is being operated. The vertical camera is in a well in the extreme left foreground.



In Service with the Royal Air Force



The ability to complete pilot training to "Wings" standard on the minimum number of aircraft types is an ideal at which all Air Forces aim. The JET PROVOST has demonstrated that with a maximum level speed of more than 280 knots, a ceiling of 35,000 ft., a retractable nosewheel undercarriage, air brakes and a turbo jet engine, it is ideally suited to ab initio training in addition to leading into the advanced trainer . . . so enabling the two-stage training ideal to be maintained for many years to come. Furthermore, the need for jet conversion training on the expensive Advanced Jet Trainer no longer arises.

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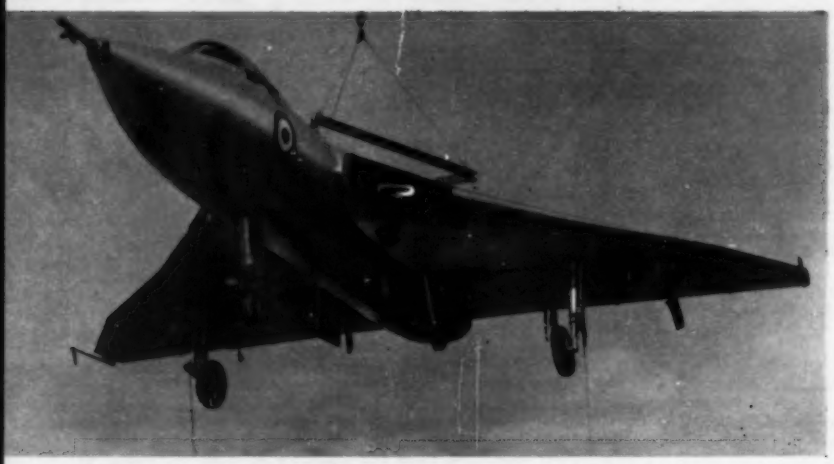


The formation is composed of Soviet Air Force Flashlight (Yak-25?) all-weather fighters, of standard pattern. These may be compared with a new experimental version, with pointed nose and larger engines, illustrated last week. The Avro 707A, seen being unshipped from H.M.A.S. "Melbourne" (it is now starting a research programme in Australia), has a "kinked" leading edge, as on the Vulcan.

AIRCRAFT INTELLIGENCE

U.S.A.

McDonnell F-101A Voodoo. This twin-jet, long-range, supersonic fighter has been flown from Edwards A.F.B. at a gross weight of 49,000 lb.

Learstar Mk 1. Latest orders for Mk 1 Learstars are from the Sinclair Refining Company and W. R. Grace and Co. Both machines will seat ten passengers and will have "ultra-modern communications and navigation equipment." These orders ensure Mk 1 Learstar production until February, 1957.

France

S.N.C.A.S.E. Fonceur. An aircraft so named has been designed for overseas tactical support. Alternatively described as the X.116, it has "secret" armament and will have a transport counterpart. The Fonceur is of twin-engined, low-wing layout, with single fin and rudder and nose-wheel undercarriage. Initially designed to have 800 h.p. piston engines, it will eventually have Turboméca turboprops. Two prototypes will be built at Marignane.

U.S.S.R.

New and Modified Aircraft. These notes tentatively identify aircraft shown at the Tushino display on June 24 and at Kubinka on the following day. Of the three supersonic deltas reported over Tushino, one—credited to the designer Pavel Sukhoi—was illustrated in our issue of June 29. A second is said to have differed in having a fin similar to that of the Convair F-102, with mid-mounted tailplane. At the time of writing there is some confusion concerning an aircraft which has been described as an "enlarged Farmer" or "Super Farmer." This may be the type illustrated in *Flight* last week, having a fuselage and tail resembling those of the delta first described. The standard Farmer is now positively identified as the Mig-19, and the twin-jet, all-weather Flashlight fighter is almost certainly the Yak-25. The standard Flashlight is illustrated on this page; a second has larger engines and a pointed radome, as shown last week; and a third—possibly a light bomber—has a transparent nose. The Antonov turboprop transport referred to in our June 29 report is thought to have power units of about 4,000 h.p. each; the nacelles extend far forward of the leading edge and there is a rear-loading door. The main undercarriage is housed in fuselage fairings, as on the latest American military transports. At Kubinka was a Canberra-sized swept-wing light bomber, said to be supersonic, and this same machine appeared in rehearsals for the Tushino display though it was absent on June 24. Ilyushin is said to be the designer. The jet-propelled ground-attack aircraft shown at Kubinka had external carriers for rockets and bombs and is thought to be intended as an Il-10 replacement. The naval attack machine, with turboprop powerplant and contra-rotating airscrews, is said to have been designed for anti-submarine duties and to bear a similarity to the Fairey Gannet. Mr. Tupolev told our contemporary *Aviation Week* that the 170-passenger transport, intended for domestic and international operation, is nearing completion; another forthcoming transport—a four-turboprop machine designated Il-18—is said to have a low-mounted, swept-back wing, and to carry 70 passengers.

Poland

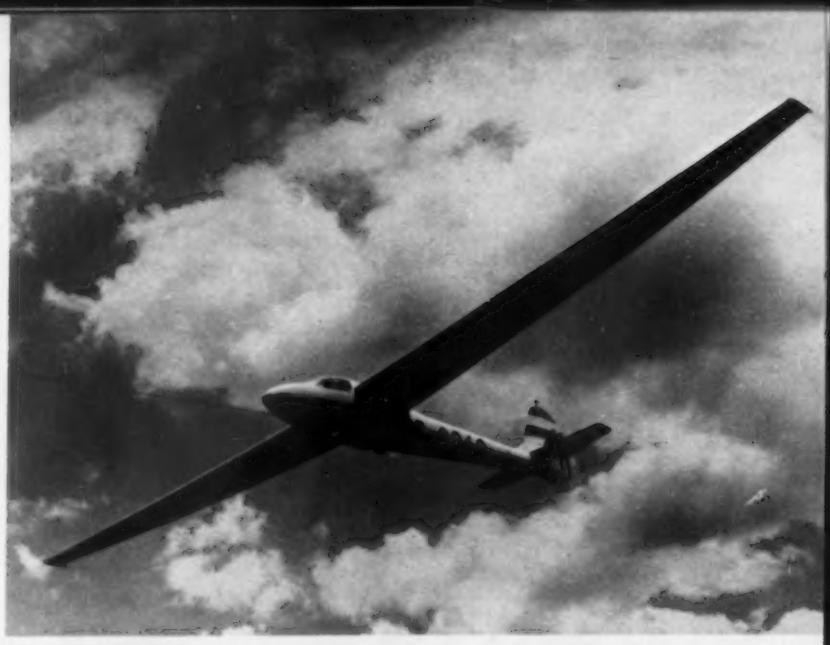
PS-8 Bies (*Devil*). This new Polish two-seat all-metal trainer is already in production. The engine is of 320 h.p. and the undercarriage of nosewheel type. Top speed is 186 m.p.h. and J. Soltyk is the designer.

Polish-built Helicopter. Based on the Russian Mi-4 and known as the SM-1, a new Polish helicopter is to go into production during the next few months. Speed is given as 125 m.p.h.

Czechoslovakia

New Czech Fighter. It is reported that a new fighter of national design is being built in Czechoslovakia. Characteristics are sharply swept wings; a top speed "near to that of sound"; full radar equipment; and provision for a variety of weapons.

A particularly informative view of the Chance Vought XF8U-1 Crusader deck-landing fighter, showing the variable-incidence wing and droop-snoot flaps.



Resch of Austria makes a serene cloud-study in his Mg. 23.

WORLD GLIDING

by
Kenneth Owen
and
Alan Yates

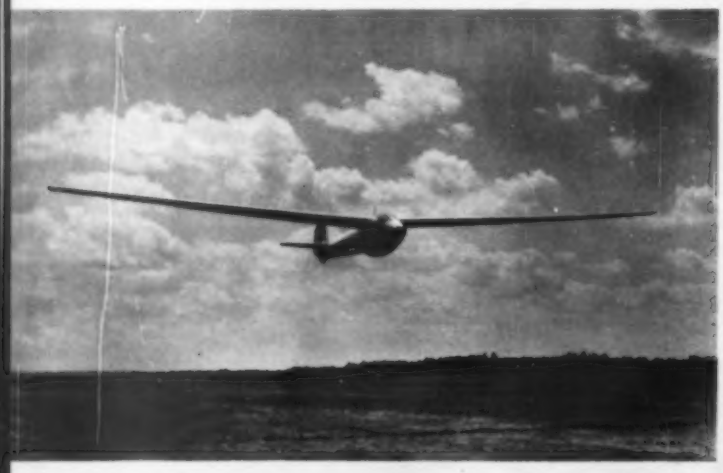
"Flight" photographs

THIS account of the first week's flying in the World Gliding Championships comes from our special correspondents at St. Yan.

THE yellow dust is still hanging in the air late on Friday evening. The day has included an opening ceremony by a Secretary of State for the Merchant Navy, with music by an Air Force band. A saxophone, wailing through a background loudspeaker, seems as tired as the straw-hatted women in black who have been selling beer and fruit drinks all day. There is the light purring of Jodels in the air, and subdued voices and a quietly stuttering typewriter in a nearby office. One would be excused for *not* realizing that an international gliding meeting is about to take place. But it is.

This was two weeks ago, and this was St. Yan.

Since that opening day of the 1956 World Gliding Championships, many thousands of kilometres have been flown by the competing pilots and a number of outstanding flights have been made —under a variety of weather conditions. Pilots, crews and journalistic hangers-on have become acquainted with the fascinating selection of colourful and exotic sailplanes on view—some expensive Cadillac-type machines and others plain, honest and relatively simple gliders of well-known ancestry. It is with the performance of the pilots of these machines during the first week of the championships that this article is concerned.



Friday, June 29. Official opening ceremony, reported in last week's issue and above. The entry list had changed slightly from that originally announced (and printed in *Flight* of June 29) to that given on page 87 (the contest numbers, chosen by ballot, show the order of take-off on the first day).

Saturday, June 30 (First contest day). "Today the situation is very complex on the France," began the genial French met. man at the first morning's briefing. Outside the "salle de brieffing" (sic) the sun shone warmly in an absolutely clear blue sky, as pilots were told of a warm, unstable air mass which was following a front moving at some ten knots across from south-west to north-east. Cumulus clouds with local thunderstorms were forecast, winds were southerly, and in general conditions promised well.

The specified task for the first day was free distance—but, as Monsieur Agésilas, the director-general, hastened to point out, pilots must not cross the French frontier. First take-off was to be at 10.45. Most of the pilots appeared pleased with the task and the weather prospects, and noted individual goals to the north and north-east before their sailplanes were car-towed over to the launching position.

With a total of 58 machines to be launched, the organization for getting them into the air in reasonable order needed to be good—and it certainly was. A line-up of 20 Stampe S.V.4c tug aircraft of the School of Flying at St. Yan was ready and waiting, engines running, well before the scheduled time, as the sailplanes were being positioned in rows of ten.

Ivans (U.S.A.) in the British Olympia IV was the first away, followed at 30-second intervals by the other waiting gliders. The Stampes flew a wide towing circuit, releasing their sailplanes at 600 metres over the airfield, and then wasting no time in getting down again for the next take-off. To save time, landings were made with tow-lines still attached. The planned 30-second rate of launching was achieved with an amazing precision, and there was a ten-minute interval after the single-seaters, before Goodhart and Foster were launched in the blue and cream Slingsby T.42, which was the first of the two-seater line.

Last away, having voluntarily delayed his launch, was Guido Ferrari in the Italian Eolo 3V.1, a slim vee-tailed machine which must surely be the only sailplane to sport the badge of the Throttle Benders' Union on its nose. Then, less than an hour after the first launch, crews could relax awhile—as could the numerous photographers, who had seemingly concentrated on the two women pilots, Hanna Reitsch (Germany) and Edibe Subasi (Turkey) and on the French Bréguets. Also able to take a breath after being very hard-pressed just before the launching was the Pye representative, who was caring for his company's radio equipment used by the British and other teams. He had arrived at St. Yan late the previous night, after being delayed for three days at Dunkirk by Customs officials who did not wish radio equipment to be imported into France without the required volume of paper-work.

Although cumulus clouds were visible in the distance, the sky above and around St. Yan remained a clear blue after the take-off of the competing gliders. Pilots were able to contact some

(Left, above) Brame of Canada in his handsome Geier II, with the interesting shape of the Elfe M, flown by Nietlispach of Switzerland, below. Note the in-flight attitude of the Elfe's wing.

useful dry thermals quite near the site, however, including an old faithful to the north-east which allegedly maintained exactly the same position in any wind-direction. Soon the field was quiet again and relatively deserted, almost all sailplanes and trailer crews having begun their journeys. Ames in the Canadian Bréguet 901 returned to the field after a control linkage in his air-brake mechanism had jammed. but was launched again, after a replacement had been made, at 2 p.m.

The first landing reported was that of Dubs, the Swiss WLM.II pilot, who had made 117 km to the north-east. By the end of the afternoon, there were many numbered pins in the map in the operations room, and they formed a definite if straggling line in the general direction of Nancy and the "top right-hand corner" of France. As news of later landings was received, the line of pins dog-legged to the north-west, running along just below the border of Luxembourg and Belgium. Some 30 machines had each flown between 300 and 400 km.

It had not been easy all the way, however. On the north-easterly flights from St. Yan there had been a dead area around Dijon. Those who had successfully passed Dijon had all gone on farther than Chaumont. The day's farthest flight was made by José Cuadrado in one of the Argentine team's Skylark 3s, covering a distance of 431 km to a point (directly north of St. Yan) near Maubeuge. The two-seater list was headed by the Turkish Ka.2b which, however, had ignored the director-general's warning and had landed in Luxembourg. Its distance to the border, 372 km, was counted for scoring purposes.

Of the British team, Goodhart and Foster in the T.42 had achieved 197 km; Geoffrey Stephenson (Skylark 3) 327 km and Philip Wills (Skylark 3) 119 km. Many pilots did not return from their retrieves until the following day, Sunday (and the Turks from Luxembourg not until late Monday night). An unshaven and tired-looking Paul MacCready arrived back at lunch-time on Sunday, and reported that his 389-km flight to Mézières (Saturday's second-longest distance) had been made in two legs, to the north-east, and then north-west along the border. Conditions were good until about 4.30 p.m., he said, after which he had managed to stay up, drifting along with a very light southerly wind, until 6.15 p.m.

A close third to Cuadrado and MacCready was Gorzelak of Poland, flying a Jaskolka Z, whose achieved distance was 388 km. The Polish two-seater Bocian Z did well, too, covering 369 km, while third in the two-seater class were Rain and Stepanovic in the Yugoslav Kosava (364 km). Foster and Goodhart were placed eighth in the two-seater class.

Among the day's flights was one of 335 km to Metz airfield (previously declared as his goal) by Frank Brame, of the Canadian team, flying a Geier II. This flight added a diamond to Brame's "Gold C" badge, and set up a new Canadian national goal-flight record. Brame confirmed that conditions as far as Dijon had been tricky, with little other than dry thermals, but that after that point there had been plenty of active cumulus. He had arrived over Metz with 3,000ft in hand.

Sunday, July 1. As many pilots and aircraft had not returned to St. Yan, Sunday was declared a rest day. Many hundreds of people from the surrounding district, unaware of this, came along to spend the afternoon at the airfield, in spite of Camphill-style downpours from a brace of king-sized thunderstorms. The visitors were treated to flying display of superb quality by the resident pilots of the St. Yan centre.

The Stampes of the *Patrouille de St. Yan* gave their customary formation display which, although already seen several times by the gliding contingent on the airfield (the team normally practises its routines at 8 o'clock every morning when the weather is good), was still a joy to see again. Other items included a boisterous Minijet demonstration, sailplane aerobatics, a solo display by a vintage Morane Saulnier, and a 40-second delayed drop by two young parachutists, one of whom came uneasily close to literally "dropping in" on the director-general — in his private office.

Sarodic, flying the shapely Meteor, one of the three Yugoslav entries (right), and, below, the Bréguet 901, flown by 1954 champion Pierre.

Monday, July 2. Most occupants of the tents and huts of St. Yan were awakened early this morning by a fierce gale and driving rain, which caused many pilots and crews to dash from their tents to the line of trailers at high speed. The high winds passed quickly, however, although the rain stayed to give again the impression of Camphill—the main difference being that the mud is a lighter, yellower colour at St. Yan.

At the morning briefing it was announced that there would be no flying that morning, but possibly in the afternoon. Behind the cold front that had passed over so violently was a region of polar maritime air, which would give unstable conditions all day.

A goal race to Boutheon aerodrome, near St. Etienne (a distance of almost exactly 100 km) was announced when pilots reassembled for the second briefing at 1.30 p.m. Winds would be from 260 to 300 deg, take-off would be in the order of the previous day's final positions, and (the met. man summed up) "All the way, instability."

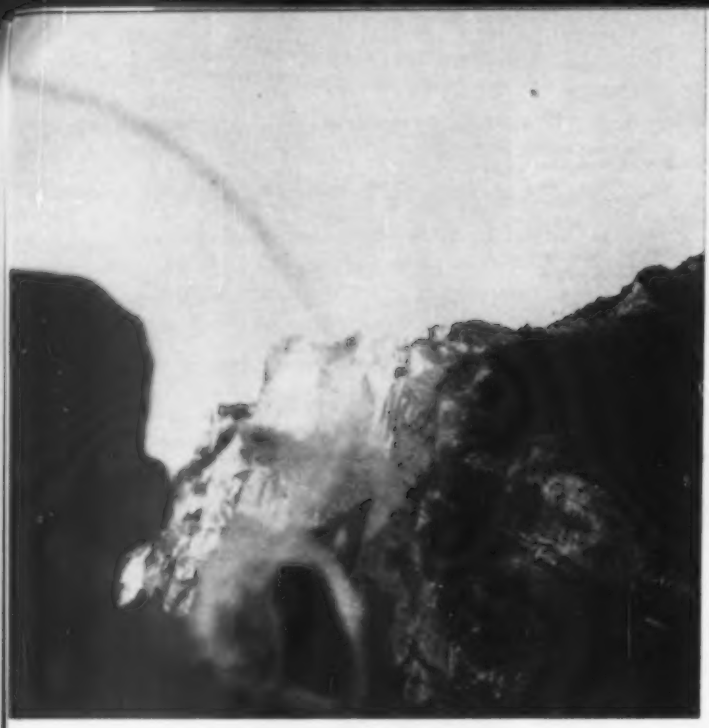
Cuadrado, wearing a smart checked cap in addition to his blue-and-cream Skylark 3, was first to be launched, on a westerly take-off at 2.15 p.m. In quick succession the other machines followed, but it was soon apparent that few, if any, would be able to get away from the site from the first release. The cold front which, lying north-south and moving slowly east, had been expected by many pilots to assist them (provided they could fly along the easterly edge), had moved across too quickly, and the sailplanes were being released into the region behind the frontal cloud.

Just after Stephenson had taken off in his flame-coloured Skylark 3, some 12 minutes after Cuadrado, a Bréguet 901 was seen circling low and coming in to land. This was the beginning of a steady stream of returning gliders, and by 3 o'clock almost everyone was back at the launching area. Wills had delayed his take-off, but he, also, was unable to find lift. The only machine to stay up after the first launch was the T.42, which could be seen circling beneath a very dark cu-nim to the north of the field. Behind the front was a large area of clear sky, and most pilots were waiting for the approach of the better conditions indicated by a line of cumulus to the west.

The rush for second launches began at 3.20, with Thomson's red Olympia, No. 15, first in line. Although quite a number of aircraft subsequently needed a third launch, cu-nims were building up near the site now, and beneath them groups of up to twelve machines could be seen circling and climbing rapidly. The T.42 landed to take advantage of a second release-time and the improved conditions; it was obvious now that a large amount of cloud-flying would be required of pilots completing the course.

The final tows were made by the Stampes into the teeth of a local thunderstorm and, soon after, the remaining ten circling sailplanes were swallowed up into the dark grey mass of a massive cu-nim. Those on the ground crossed their fingers, and began to wait for news.

By early evening, there was a straggling line of pins on the map, most of them more-or-less on the right track. Ten single-seaters and six two-seaters had failed to leave St. Yan, however, while a large number had failed to reach farther than half-way, and were scattered around the Roanne area. It had been a good day for the Americans, all three of whose aircraft had reached



Dunstable was never like this—Nick Goodhart's head and part of the Dauphine Alps, as seen by Frank Foster during the T.42's 340-km flight on July 3. The Jura mountains were sampled later.

WORLD GLIDING . . .

Boutheon. The total number completing the course was only seven, the others being Goodhart and Foster, Wills, Juez of Spain, and Saradic of Yugoslavia in the all-metal Meteor.

The fastest time for the 99.8 km race was that of Saradic, 1 hr 21 min 7 sec, giving a speed of 73.8 km/hr. In the single-seater class, he was followed by Ivans (1 hr 44 min 8 sec, 57.5 km/hr), Wills (1 hr 56 min 51 sec, 51.2 km/hr), Juez (2 hr 13 min 34 sec, 44.8 km/hr) and MacCready (2 hr 24 min 58 sec, 41.3 km/hr). Trager and Miller took 1 hr 22 min 51 sec (72.3 km/hr), while Goodhart and Foster made it in 1 hr 30 min 58 sec (65.8 km/hr). Third in the two-seater class was the French Bréguet 904 (Rousselet and Trubert) which achieved 75 km. Stephenson made 74 km, to be placed seventh on the day's results.

Typical of the pilots' reports was that of Goodhart and Foster, who spent about 30 min over St. Yan and an hour en route. They had been in cloud all the way except for two small gaps, one of which had been conveniently over Roanne. Their first climb had been to over 16,000ft, after which they set course for Boutheon, making only one further climb en route. Wills reached 22,000ft during his flight, and Juez reported some 24,000ft. Many pilots reported heavy hail and icing inside the cu-nims.

The positions after Monday's flying were (single-seaters): 1. MacCready (U.S.A.), 1,452 pts; 2. Ivans (U.S.A.), 1,412; 3. Juez (Spain), 1,404; 4. Saradic (Yugoslavia), 1,377; 5. Bar (Israel), 1,257; and 6. Stephenson (Great Britain), 1,215; with Pierre in 9th place (948 pts), Hanna Reitsch 11th (926) and Philip Wills 13th (841): (two-seaters) 1. Trager-Miller (U.S.A.), 1,505 pts; 2. Rousselet-Trubert (France), 1,202; 3. Goodhart-Foster (Great Britain), 1,174; 4. Nowotarski-Sandauer (Poland), 941; and 5. Yaykin-Argun (Turkey), 800.

Tuesday, July 3 (Third contest day). After the rains of the previous two days the ground was extremely wet this morning and, as the air mass covering central France was also humid, it was decided to give the drying effect of the sun a chance to produce improved lift. An afternoon tack was accordingly set.

This was for distance along a line passing from St. Yan through Cuers, an aerodrome just north-east of Toulon. The track was 165 deg (T), and the maximum distance, assuming nobody would venture out into the Mediterranean, was slightly over 400 km. The forecast winds were westerly, except for the Rhône valley, where the northerly mistral was to be expected.

Flying began at 1 p.m. Mr. C. E. Wallington, meteorologist to the British team, had forecast wave conditions over the lower Alps and, while thermal lift was reasonable over St. Yan, crossing the Rhône valley might be tricky due to the effect of the mistral. It promised to be another interesting day.

That evening, the pins on the display map showed a wide scatter of landing sites. Of the pundits, Ivans, Wills and Saradic had landed at Cuers (389 km), while MacCready had pressed on the final few kilometres to the coast, landing at Hyères. Goodhart and Foster had made 340 km, landing dead on the line, and the majority of the other machines had come down west of the specified track.

Subsequent interviews with the pilots indicated just how exceptional the day had been. Along the line from St. Yan to Cuers, three distinct types of lift had been used in turn. These comprised thermals for the first half of the way (roughly as far as the Rhône valley); slope-soaring over the Dauphine Alps; and finally lee waves caused by the northerly mistral passing over the east-west ranges of the more southerly mountains such as those of Vaucluse, Luberon, Ventoux and Lure.

These three sections were punctuated by two broad groups of landings, the first (near Lyon) where pilots had been unable to cross the Rhône valley and contact the ridge lift, and the second in the region of Orange, pilots having failed to contact the wave.

For many of the pilots who accepted the challenge of slope-soaring in the lower Alps, Tuesday's flying provided an unforgettable experience. "Slope" in some cases meant vertical cliff-face, and the narrowness of the lift-band demanded flying only one or two spans from the side of these "slopes." In the valleys the air was extremely turbulent, and landing fields were few. Some pilots worked their way laboriously up individual ridges for up to two hours before gaining sufficient height to head farther south. Main compensation for this uncomfortable type of flying lay in the spectacular views of the snow-capped ranges of the Alps—although perhaps a somewhat academic point to a single-seater pilot with one eye on a cliff-fanning wingtip and the other on his variometer.

The mountain waves, experienced for the first time during the St. Yan contests, had not been marked by any cloud formation. Those pilots familiar with wave-flying conditions were able to smell them out and use them, however, although the waves met today gave relatively short beats and generally weak lift. Ivans, veteran of the famed Bishop wave in California, took the Olympia IV up to 22,000ft today—and arrived over Cuers with 10,000ft in hand. MacCready landed at the French naval air base at Hyères at 9.15 p.m., after covering some 40 miles on slope lift and making a 75-mile final glide. It was dark as he approached the coast, but the lights on one runway at Hyères were on.

After Tuesday's flying, the single-seater list was again headed by MacCready (2,252 pts) and Ivans (2,174), while Saradic of Yugoslavia had moved up into third place. Although the day's best two-seater flight had been one of 362 km by Haase and Heinzel in the German HKS-1, followed by Rain and Stepanovic (346 km) with Goodhart and Foster in third place (340 km), it was the British duo which now led on total points (1,853). The Trager-Miller combination lay second with 1,802, and the French Bréguet flown by Rousselet and Trubert was third with 1,651.

Wednesday, July 4. As many of yesterday's long-distance pilots had not yet returned to St. Yan—and as many who had were badly in need of sleep—it was decided at a conference of team captains that there would be no contest flying today.

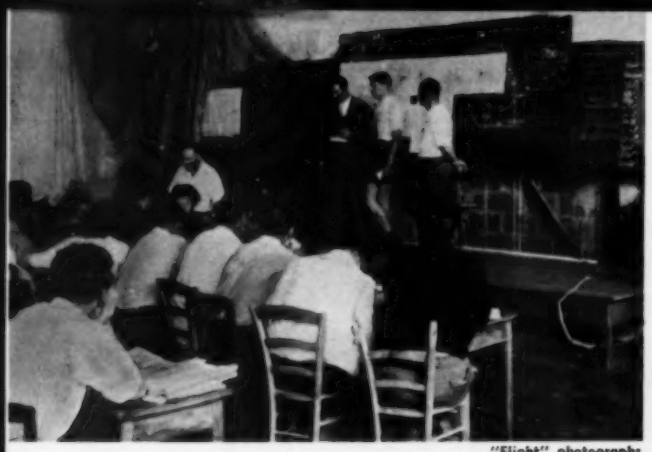
During the day the last of the retrieved trailers returned to St. Yan and the pilots spoke of the varied and interesting flying conditions encountered on Tuesday. The temptation of an organized visit to the vineyards of Beaune had to be resisted, sadly, by at least one journalist in the interests of this article.

Indicative of the retrieving times achieved were those of Goodhart and Foster, whose crew of Lorne Welch and Peter Flower reached the T.42 at 11 p.m. and who returned to St. Yan at 8.50 this morning; and of MacCready, whose crew arrived at Hyères at 3 a.m. and, pausing only for MacCready to take his first look at the Mediterranean, made the return trip in 14½ hr.

Among the casualties of the previous day's flying were the Yugoslav Orao, No. 3, which was damaged by hitting a fence on landing, and the elegant Eolo 3V.1 flown by Ferrari, which ground-looped on landing in the Rhône valley, the fuselage breaking into three sections. The Orao was brought back to be repaired in the St. Yan workshops, while the Eolo, beyond repair for the championships, was left at Lyon for later collection by the Italian team.

Thursday, July 5 (Fourth contest day). Today a high-pressure area was covering central France, there was a clear blue sky at St. Yan at breakfast time, and the day's task was declared to be a short triangular race of about 115 km. The turning-points were to be the airfields of La Palisse and Roanne, giving three roughly

Work on the tailskid of the Jaskolka flown by Cortigny of Belgium. "Flight" photograph



"Flight" photographs

At the morning briefing (above) the day's task is announced. Right, American pilots Kemp Trager, Gene Miller, Bill Ivans and Paul MacCready, seen with the Olympia IV flown by Ivans.

equal legs in the directions south-west, south-east and north. The winds were westerly.

The first take-off was at noon, the order of launching being the reverse of the current placings. Cirrus had spread across to the south, and there were now a few small cumulus clouds near the field. It was by means of dry thermals in the blue sky, however, that most pilots gained height after release and before crossing the starting line. In the first popular dry thermal there were seen to be 16 machines, but this was followed by another to the north-east of St. Yan in which no fewer than 26 circling sailplanes could be counted.

Later, as landing reports came in, it became obvious that conditions were not easy along the first leg of the triangle. Many gliders had come down at La Palisse itself, and many more had not managed to complete even this first leg. A suggestion was that the area flown over was not one of great contrast, the instability comprising many small thermals and few large ones.

During the afternoon many trailers hastened in through the gates and past the control tower to the launching area, and quick jobs of rigging were accomplished prior to second attempts at the triangle. The first aircraft to complete the course was the German HKS-3 flown by Wietuchter, which dived down and across the line at 4.23. The first, and only, two-seater to finish was no. 72, the Argentine Condor 4 flown by Sadoux and Bazet, which came in some 1 hr 20 min later. Just before six o'clock an extremely well-judged long and low approach proved to be that of MacCready's Bréguet, while Ara's Spanish Sky arrived simultaneously with more height to spare.

Few were surprised to learn that the so-consistent MacCready had logged the fastest time for the triangle (2 hr 39 min 23 sec), giving an average speed of 44 km/hr and pushing up his lead on points still further. The day's marginal conditions had resulted in only seven other single-seaters completing the course, these being (in order of speed) Arbajter, Wietuchter, Ara Gorzelak, Ortner, Feddersen and Juez. As only one two-seater had flown the complete triangle, the contest in this class was marked as for distance along a fixed direction.

After today's flying the top placings were: (single-seaters) MacCready, 3,052; Gorzelak, 2,411; Juez, 2,409; Saradic, 2,381; Ivans, 2,174; Bar, 2,171; (two-seaters) Trager-Miller, 2,098; Nowotarski-Sandauer, 2,009; Goodhart-Foster, 1,853; Rousselet-Trubert, 1,836.

Friday, July 6 (Fifth contest day). A free-distance task and afternoon take-offs were the basic ingredients of today's flying. The morning layer of stratocumulus had been dispersed under the sun's heat by midday, and the first take-off was at 2 p.m.

The winds were westerly and it seemed logical that most pilots would begin their flights with an easterly leg from St. Yan, in which direction moderate thermals up to about 4,000ft were expected. The critical decision could then be whether to fly north-east or south-south-east after this start. The choice appeared to be between better tailwinds and weaker thermals in the north-easterly direction, and better thermals with more difficult country for landing to the south.

By five o'clock ten machines had landed, their pins stringing down to the south-east from St. Yan to Lyon. Outward-bound retrieving crews could derive some pleasure, however, from the fact that, even if distances were short, their pilots had chosen the regions of Beaujolais and Mâcon for their landings. Over the next few hours, the numbered pins spread out to fill an area to the north-east of this line. MacCready was reported down at 134 km, and Wills at 118 km. It was obviously not a good long-distance day.

By ten o'clock, however, had come surprising news. Toutenhoofd of the Netherlands had landed his Skylark 3, only 45 min earlier, at Mondragon, north of Avignon, after a south-south-easterly flight of 240 km—the day's best performance. Stephenson was runner-up with 162 km to Geneva (crossing the Jura mountains), while Goodhart and Foster had flown over a small piece of Switzerland and Lake Geneva to land on the French shore, so heading the two-seater list with 180 km.

Only 21 years of age, Toutenhoofd had beaten his more experienced competitors by flying east, and then south down the Rhône valley. With no previous experience of hill lift or wave soaring, he had used both (to 1,500 m and 2,800 m respectively) in the later stages of his flight. It was an impressive performance by the lanky young Dutchman, who holds his country's only "Gold C" badge with two diamonds.

MacCready retained his position at the top of the single-seater class after Friday's contest, with a total of 3,382 pts. He was followed by Juez (2,709), Saradic (2,699) and Gorzelak (2,670) with Wills in 12th place and Stephenson 16th. The British T.42 was once again leading in the two-seater class with 2,501 pts, followed by Yugoslavia (2,333), Poland (2,154) and U.S.A. (2,116).

In next week's issue this report from St. Yan will be concluded. This final part will include a description of the second week's flying and a summing-up of the championships.

1956 WORLD GLIDING CHAMPIONSHIPS ENTRY LIST

Contest No.	Pilot	Country	Sailplane
Single-seaters			
1	Ivans	U.S.A.	Olympia IV
2	Cuadrado	Argentine	Skylark 3
3	Arbajter	Yugoslavia	Orao 2c
4	De Rosa	Brazil	Baros Neiva 1
5	Dommisse	South Africa	Bréguet 901s
6	Ara	Spain	Sky
7	Wills	Great Britain	Skylark 3
9	Oda	Japan	Bréguet 901s
11	Lacheny	France	Bréguet 901s
12	Toutenhoofd	Netherlands	Skylark 3
13	D'Otreppe	Belgium	Air 102
15	Thomsen	Denmark	Olympia
16	Kumpost	Czechoslovakia	VSM.40 Démant
17	Wietuchter	Germany	HKS.3
18	Heinonen	Finland	Air 102
19	Kalmar	Hungary	Z.08
20	Uygum	Turkey	Air 102
21	Dubs	Switzerland	WLM.2
22	Georgeson	New Zealand	Air 102
23	Harrer	Austria	Mg.23
24	Gore	Poland	Jaskolka Z
25	Brame	Canada	Geier II
26	Silesmo	Sweden	Bréguet 901s
27	Bar	Israel	Air 102
28	Persson	Sweden	Weihe
29	Cartigny	Belgium	Jaskolka
30	Gorzelak	Poland	Jaskolka Z
31	Mezo	Hungary	Z.08
34	MacCready	U.S.A.	Bréguet 901s
35	Pierre	France	Bréguet 901s
36	Nietlispach	Switzerland	Elfe M
37	Subasi	Turkey	Weihe
38	Munch	Brazil	Baros Neiva 1
40	Jalkanen	Finland	Pik.3
41	Resch	Austria	Mg.23
42	Koch	Netherlands	Skylark 3
43	Ames	Canada	Bréguet 901s
44	Feddersen	Denmark	Olympia
45	Juez	Spain	Sky
46	Hollan	Czechoslovakia	VSM.40 Démant
47	Ferrari	Italy	Eolo 3V.1
48	Stephenson	Great Britain	Skylark 3
49	Reitsch	Germany	Zugvogel
50	Ortner	Argentine	Skylark 3
51	Saradic	Yugoslavia	Meteor
Two-seaters			
61	Goodhart and Foster	Great Britain	Slingsby T.42
62	Brigliadori and Fanoli	Italy	Canguro
63	Rousselet and Trubert	France	Bréguet 904
64	Trager and Miller	U.S.A.	Schweizer 2-25
65	Nowotarski and Sandauer	Poland	Bocian Z
66	Rain and Stapanovic	Yugoslavia	Kosava
67	Haase and Heinzel	Germany	HKS.1
69	Nunez and Vicente	Spain	Kranich 3
70	Yaykin and Argun	Turkey	Ka.2b
71	Sebesta and Jansk	Czechoslovakia	L.13
72	Sadoux and Bazet	Argentine	Condor 4
73	Tandefelt and Rautio	Finland	Bergfalke 2
74	Ostermayer and Angerer	Austria	Mg.19c

"Flight" photographs

FIGHTER, ALL-WEATHER, MARK 1

No. 46 Squadron Works Out the First Gloster Javelins

ANNOUNCING the Gloster Javelin as the first delta-winged aircraft to go into service anywhere in the world; the first R.A.F. all-weather fighter designed from the start for that rôle; and the largest fighter ever to be adopted by the R.A.F., Air Marshal H. L. Patch, A.O.C-in-C. Fighter Command, introduced the Javelin FAW.1 to an invited audience at Odiham, Hants, last week. The R.A.F.'s latest all-weather fighter, he said, had been developed to meet the threat of the single, atom-bomb-carrying raider trying to penetrate Britain's air defence in poor weather, by day or night. Against this threat the Javelin was adequate and would remain so throughout its Service life.

The Javelin (writes *Flight's* representative at Odiham) should be viewed as a key component in Britain's fast-developing air-defence weapon system. As the new aircraft—the executive element of the system—is introduced into service, the control and reporting organizations on the ground are also undergoing remarkable transformations. Automatic devices can now give the directors an immediate and accurate picture of the air situation, and from the operations-rooms controllers can be in direct land-line communication with crews sitting in their Javelins (by means of the "telescramble" land-line system now standard in Fighter Command). Though no specific details of performance have yet been released, it can be stated that the Javelin, on being scrambled, can reach 40,000ft in half the time taken by its predecessors, such as the Meteor night fighters. Since the rather more lightly loaded Meteor day fighter reaches this height in 16 min it could be assumed that the Javelin would

reach 40,000ft in 8 or 9 min. Moreover, the Javelin can—and does—operate at 50,000ft at speeds over 600 m.p.h.; and it can exceed Mach 1 in a dive.

The armament of the FAW.1 version consists of four 30 mm Aden cannon mounted in the wings, and the new British-designed A.I. radar has a longer effective range than earlier equipment. While a second crew-member is required to operate the radar, the pilot also has his own P.P.I. tube to assist him in making the final attack. It is possible to aim and fire the guns without making visual contact with the target.

Though the Javelin FAW.1 is a remarkable advance, both in performance and as a weapons platform, over any night fighter the R.A.F. has previously had, the examples now in service with No. 46 Sqn. at Odiham are being used only for intensive flying trials. From 0830 hr to 0230 hr each day pairs of Javelins are taking off at half-hour intervals practising the full gamut of operational procedures until an aggregate of 1,000 hours' flying has been built up. The object is to work the "bugs" out of the aircraft; to establish operating techniques for it; and to find out its servicing requirements in time, manpower and spares backing. The guns are being fired over the sea, though not at targets, and it is reported that fewer difficulties are encountered than might have been expected with a new installation.

Later this year the more advanced Javelin FAW.2 and FAW.4 are to go into service with two other squadrons. They will be distinguished principally by more powerful marks of Armstrong Siddeley Sapphire, by an "all-flying" tail, and by the ability to carry the air-to-air guided missiles which will enter service at a date not yet announced. The 30 mm cannon will be retained. Meanwhile even the Javelin FAW.1 is stated to have a maximum weight greater than that of the largest bombers in R.A.F. service at the beginning of World War 2, and the two Armstrong Siddeley Sapphires are said to produce horsepower equivalent to that available in a whole squadron of World War 2 night fighters.

These characteristics, plus a delta wing, might add up to quite an exacting aeroplane from the handling point of view, but in fact pilots report that the Javelin is light and pleasant on the controls. An initial wariness has given place to enthusiasm; and at high altitude pilots think that even the Hunter would give them no particular trouble, either by its rate of turn or by its general manœuvring capability. The Javelin's ailerons are fully powered and—without manual reversion—the complete circuit is doubtless duplicated to allow for failure of any of its various sections. The elevator and rudder, on the other hand, are hydraulically assisted. Tailplane incidence is variable by an electric motor and screw-jack controlled from a switch on top of the control column. A "kill button," similarly located, allows the pilot to cut the motor out should it run away. The power levers are paired to form a single hand-grip when in line and the airbrake control is on the power-lever quadrant, easily accessible by extending the middle fingers of the left hand. It was noticeable that any degree of airbrake extension can be selected. The large, comb-like braking surfaces extend above and below each wing and are reported to be extremely effective. During a controlled descent through cloud at between 200 kt and 300 kt a very high rate of descent can be achieved.

The Javelin is pressure-refuelled through a single connection at the port wing root and capacity is such that the length of an operational sortie was officially stated to be considerably greater than that of previous night fighters. The two large ventral fuel tanks destined for the aircraft have not yet been fitted, but these

Though it is the largest and heaviest fighter ever to enter R.A.F. service, the Gloster Javelin lacks none of the fighter's traditional agility. From the open back of a No. 47 Sqn. Beverley, "Flight's" photographer, L. W. McLaren, took these views of No. 46 Squadron's new aircraft. The one seen peeling off below came so close that part of the Beverley's door fittings (top right-hand corner) appear in the picture.

Like a whale shark nosing up to the stern of a boat, a Javelin closes in on the photographic Beverley to present a really close view.

FIGHTER, ALL-WEATHER, MARK 1 . . .

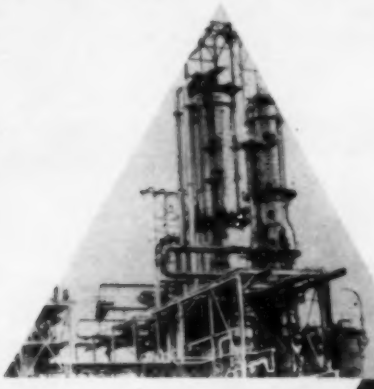
would probably double present endurance. The two Sapphires are cartridge-started and there is provision for carrying a number of spare cartridges for use in case of diversion.

The Javelin must be one of the first new R.A.F. aircraft to go into service with toe-operated hydraulic brakes (of disc type). The wide-track Dowty undercarriage and Maxaret equipment give excellent braking and control on the ground, both during landing and taxying. The nosewheel is not steerable. Single-engined flight would appear to present no problems and, because the engines are toed in and lie so close to the centre line, the large rudder tab should be sufficient to trim out full power on one engine right down to minimum flying speed.

The low-speed characteristics of the delta wing being what they are, the stall is to be avoided. At the Farnborough Jubilee Exhibition last year films were shown which illustrated the nature of, and the unusual technique of recovery from, a Javelin spin. However, the stall is reached at a very high angle of attack and probably also at a surprisingly low speed. Certainly approaches and landings at Odiham indicated no difficulty. With full flap, the touch-down angle of attack was not in the least pronounced and the speed as the aircraft was flown onto the runway appeared to be little higher than that of a Meteor night fighter. It seemed to be common practice to hold the nosewheel up for a time after touch-down before putting it down and using brakes. Landing and take-off runs were very short indeed—certainly much shorter than those of a typical modern day fighter.

Since the first prototype flew the cockpit canopy arrangement has been radically altered, principally to give the radar operator something of a clear view of the outside world. Even now, however, his eyes are just level with the cockpit coaming. The two sliding transparencies are mounted together on rails and move as one unit. When closed, the glazed arch between the two cockpits fills the gap which, in the open position, allows egress for the radar operator. The two moving parts appear to be independently jettisonable and, according to the latest Martin Baker practice, the jettisoning may be by explosive cartridge and tied in with the pulling of the ejector-seat blind.

The windscreen has a flat central panel and curved side panels, the left-hand of which hinges inwards on its lower edge to form a clear-vision opening. A small deflector shield immediately ahead of it keeps the main airstream from entering the cockpit. De-icing liquid can be sprayed over the outside of the centre panel and de-misting air can be blown over the canopies as well as the inside of the whole windscreen. The cabin is pressurized and fully air-conditioned and temperature is directly controllable. The ejector seats are Martin Baker Mk 3 J units—the letter J indicating the Javelin installation. The Mk 3 seat can be used at heights as low as 100ft and the thigh guards of earlier seats are replaced by leg-restraining harness. Pilots normally use the American type of pressure-breathing oxygen mask and



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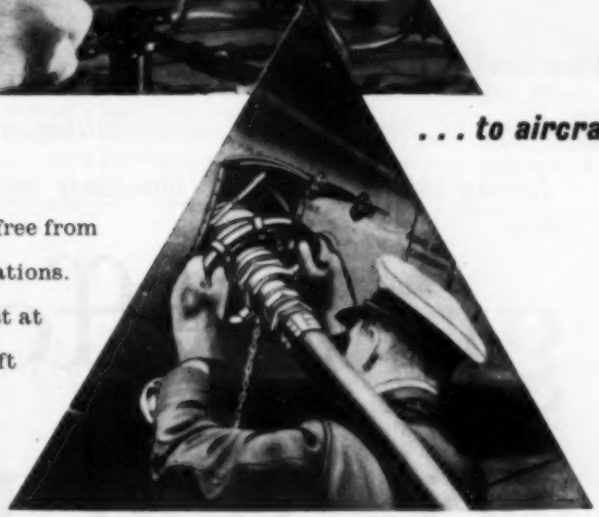

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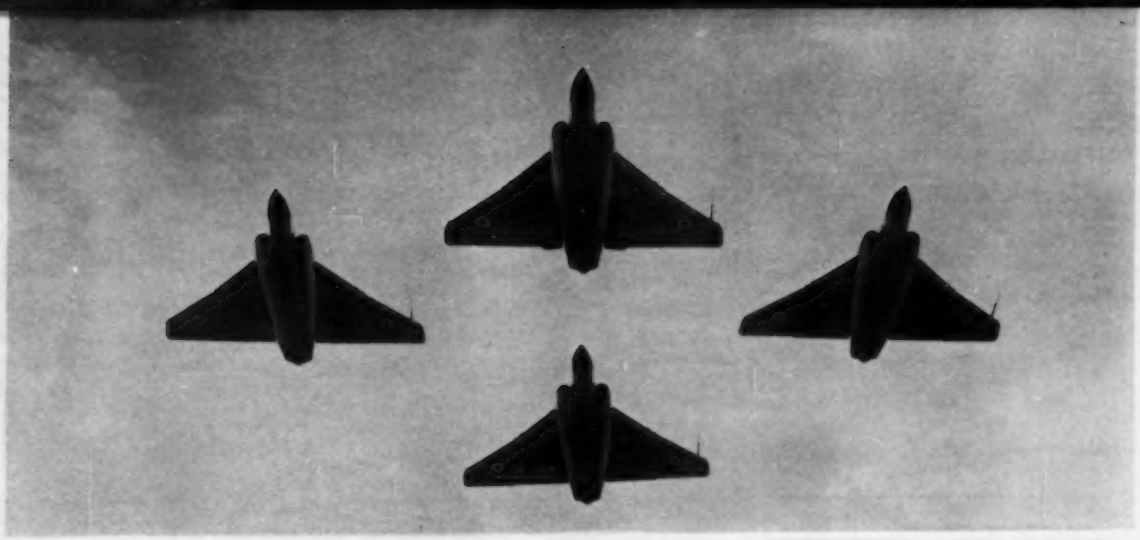


FIGHTER, ALL-WEATHER, MARK 1 . . .

a demand regulator and wear a normal g suit. Neither pressure jerkins nor partial pressure suits were in evidence at Odiham.

Although a series of steps and hand-holds are let in to the port side of the tailpipe housing, the crew and servicing personnel normally enter the aircraft with the aid of a massive ladder which attaches to the fuselage over the port intake. Access over the tail is not favoured because of damage to the high-speed finish which may result if the top of the fuselage is regularly used as a foot-path.

Nothing more than has already been related has been officially released concerning the Javelin's radar A.I. gear. It can be seen, however, that a short whip-aerial projects from underneath each tailplane and another whip aerial projects from the top of the fin. These aerials would serve V.H.F. communications and possibly a navigation aid of the Gee type. Two streamlined dipoles, one under the port intake and the other under the port wing root indicate the presence of a radio altimeter and a short strip aerial set horizontally into the skin just aft of each intake lip suggests D.M.E. or I.L.S.—more probably the latter. Other equipment externally evident includes a high-speed pitot boom on the port wing and a smallish taxying or landing lamp on each main-wheel leg.

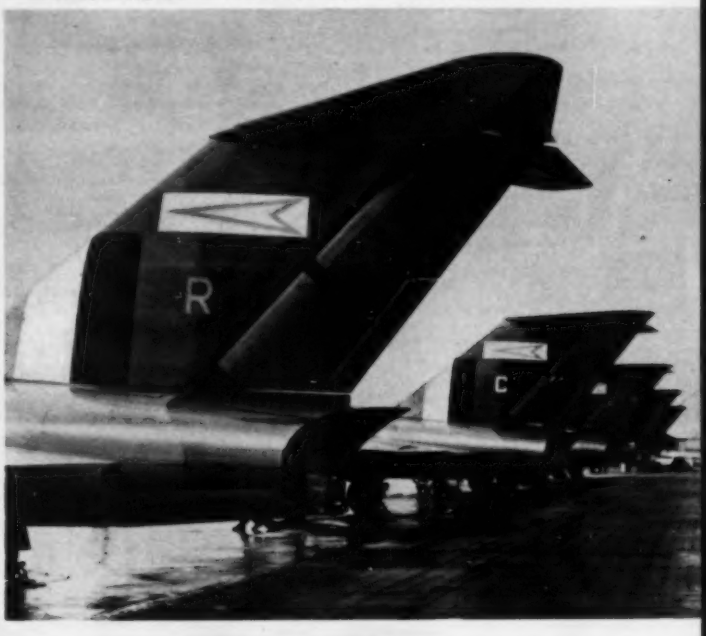
All the Javelins at Odiham were fitted with the new "pen-nib" efflux fairing and these appear to have been added to the basic tailpipe structure late in the production sequence. A fuselage break is evident just ahead of the wing trailing edge, so that a good portion of the tailpipe housing can be removed bodily. It seems probable that the Sapphires could be unshipped in this direction, though removal of the tail section would not afford direct access to the engines themselves. There is a fairly large rectangular access panel just aft of the nosewheel bay and, when at Odiham two engines failed to start first-time, the ground crew changed cartridges having obtained access through this hatch.

Although the thickness/chord ratio of the Javelin wing appears to be in the region of 11 per cent, the actual thickness is considerable and would afford space for a good deal of fuel or equipment. The guns, housed midway along each wing, are fed from ammunition containers and it appears that some form of winching is available to remove and replace these. Ejector tubes allow cases to be jettisoned, but no link chutes are in evidence and it is presumed that links are collected in the wing and removed after flight.

Representative serial numbers of the aircraft at Odiham were XA 628, 627, 620 and 571, all well into the production batch.

Since the side of the Javelin's nose is occupied by the roundel and little space is available on the side of the after fuselage, No. 46 Squadron's arrow-head marking (in red on white) has been applied high up on the fin. The usual red-white-and-blue flash on the base of the fin is very much larger than usual. Individual aircraft letters are applied on the fin in either yellow or red. All upper surfaces are camouflaged and all lower surfaces are silver.

No. 46 Squadron is commanded by W/C. H. E. White, D.F.C., A.F.C.—all-weather fighter squadrons now being normally commanded by wing commanders, with squadron leaders as flight



(Top) Four Javelins, led by S/L. J. L. W. Towler, fly past in an impeccable box formation with wheels and flaps down.

(Above) A row of "pen-nib" fairings, with broad fins carrying extra-large flashes, small squadron markings and aircraft identification letters.

(Left) Ground crewmen help the aircrews to strap in ready for the demonstration flights at Odiham last week. Roundels and serial numbers are carried on the forepart of the Javelin.

FIGHTER, ALL-WEATHER, MARK 1 . . .

Above, a Javelin over the southern English shoreline manœuvres astern of the photographic Beverley. After the air-to-air photographic session, No. 46 Sqn. crews lined up in front of one of their new craft (below). In battledress, centre, holding on "all-weather" umbrella is the C.O., W/C. H. E. White, D.F.C., A.F.C.

commanders. The number of crews per squadron seems much greater than was the case a few years ago. Since there is as yet no dual version of the Javelin, two No. 46 Sqn. pilots were sent to Boscombe Down for initial conversion; they then returned to Odiham to train the other pilots. After passing a rigorous examination on the aircraft, each pilot was taken for a flight in the observer's seat to get the feel of things and after that made his first sortie—with his observer on board. After six flights by day he made his first night flight and after 12 exercise sorties each crew was ready for a first operational trip.

The radar operators previously completed a special training course on the Javelin, and ground crews received special servicing instruction at the Gloster factory. A cockpit mock-up for emergency drill and procedure practice arrived at Odiham recently, after the crews had begun flying the aircraft.

No. 46 Sqn. rates among its numbers three ex-Fleet Air Arm pilots and one pilot who previously served in the Army. With total experience ranging from 600 hr to 2,000 hr, all pilots are on at least their second jet tour and a high proportion of them have been flying instructors.

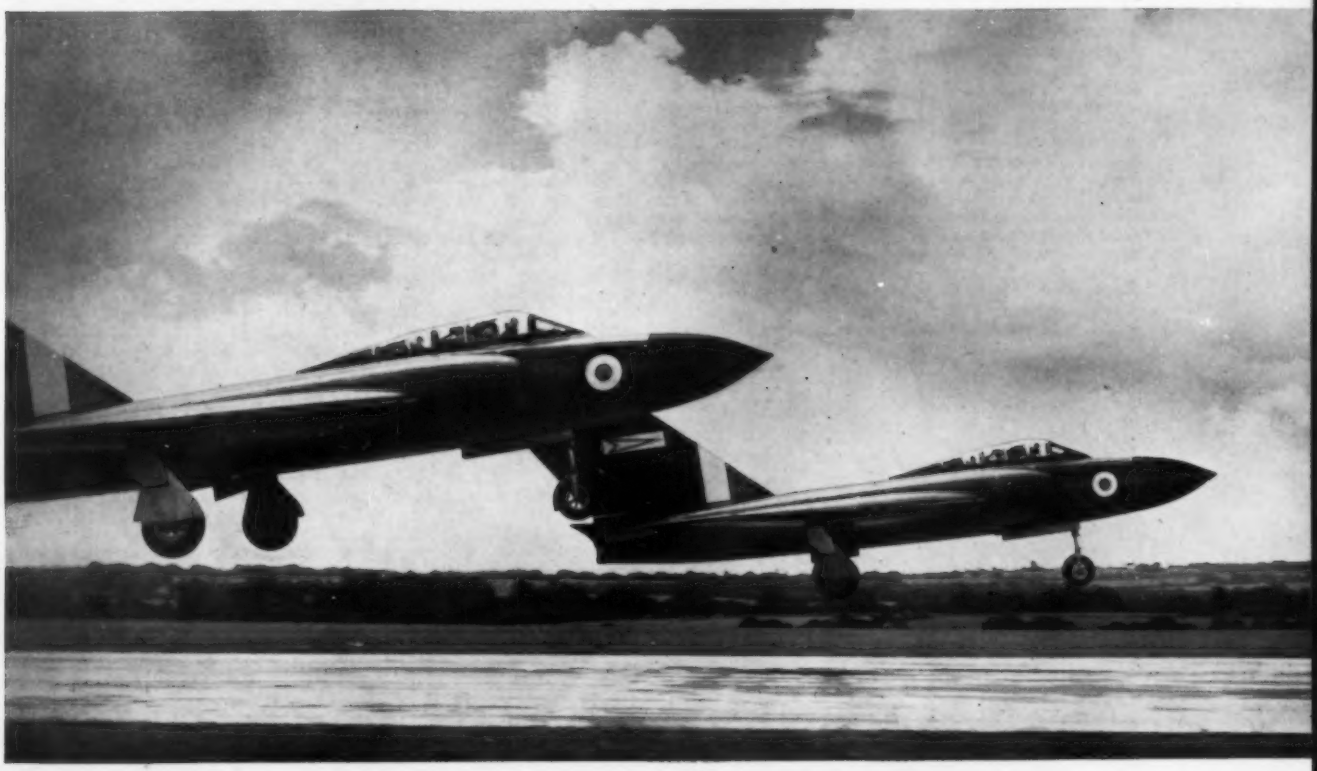
During our visit No. 46 laid on a most convincing demonstration of the Javelin's capabilities. Five aircraft were lined up at dispersal together with a Blackburn Beverley of No. 47 Sqn. which, with the rear-loading doors removed, served as an excellent platform for our air-to-air photographs. Four Javelins took off in pairs, led by S/L. J. L. W. Towler with F/O. E. H. Wright as radar operator. Spacing was very close, and clouds of vapour rose behind the aircraft as they rushed noisily down the wet runway. The fifth aircraft off was flown by S/L.

P. D. C. Street, an ex-Fleet Air Arm pilot with 1,000 deck landings to his credit, who put on an excellent individual show. His radar operator was F/O. I. Calder. Particularly impressive was a very slow fly-past in box formation by four Javelins with wheels and flaps down. This certainly proved the good low-speed-handling characteristics, for conditions were bumpy. S/L. Street followed with fast and slow passes, a series of very fast rolls and a long inverted pass, which he pushed up into a climb.

The Javelin is noisy enough on the ground, but a fast pass 50ft overhead is quite deafening. Under most conditions the big fighter produces a characteristic sound which has been aptly compared to that of a circular saw. Though one may look forward with mixed feelings to the day when this sound will commonly be heard all over England, the defensive capability that late-mark Javelins will soon afford will be of a standard never before approached. These aircraft must provide a really significant improvement in the capability of Britain's all-weather defences.

Full production of Javelins has now been under way for some time and many scores of them have been delivered to the Service. Of these the majority are still with the maintenance units in No. 41 Group, receiving routine modifications, inspections and final checks before issue to squadrons.

No. 46 Sqn. was formed in 1916 and helped to combat the German Gotha raids on London in 1917. During World War Two it was sent to Norway and flew off from H.M.S. *Glorious* to join No. 263 Sqn. at Bardufoss. When evacuation became necessary S/L. (now Air Vice-Marshal) K. B. B. Cross, the C.O., led the squadron back on board *Glorious*. All made successful landings, but *Glorious* was soon afterwards sunk by *Scharnhorst* and *Gneisenau*. The squadron was reformed and fought in the Battle of Britain before going out to help in the defence of Malta. In 1942 it became a night fighter unit and, with Beaufighters, helped to cover the Allied invasion of Sicily.



Landing and take-off are carried out in time-honoured Fighter Command fashion. Above, a peel-off from echelon starboard over the runway; below, pairs take-off.

Power to the Navy's Elbow

The Flying Control System of the D.H.110 All-weather Naval Fighter

RARELY is the public vouchsafed so intimate a glimpse of the control system of a new military aircraft as has now been made available by the de Havilland company for the D.H.110 carrier-borne all-weather fighter; and rarely has a control system been so extensively developed to provide the best possible handling conditions over a remarkably wide range of flying speeds. The requirements were particularly stringent, but the solutions finally chosen are certain to give Naval pilots both pleasure and confidence when the aircraft goes into service.

A noteworthy point which emerges from the following account is that fully powered controls probably provide the only efficient and economical control system which can be adapted for flight over such a wide speed range as that of the D.H.110 without making the aircraft unpleasant to fly at some speeds and heights. Stick movements and forces vary so much from 100 kt to Mach 1 plus, and between sea level and 50,000-odd ft, that some solution such as that now described is becoming an absolute necessity in high-performance aircraft.

Considerable development flying has been required to perfect its handling qualities over the very wide speed range required, and much of the testing programme carried out at Hatfield and Christchurch has been aimed at providing low-speed flying characteristics at least as good as, or better than, those of other naval aircraft, as well as affording a quality of control at high speeds that would match the speed and altitude capabilities of the aircraft. To satisfy its particular function, a fighter of this type must be highly manœuvrable at speeds ranging from that of the slow carrier approach to the supersonic dive; and, above all, it must be free from vices at all speeds in the conditions likely to be encountered in all-weather work.

Most Service aircraft to date have been limited to a critical Mach number by the compressibility effect encountered at the high speeds easily attained at high altitudes. The D.H. 110 was found to be free from such restrictions and so, from the outset, it was possible to concentrate on the fundamental problems which are common to all aircraft designed to operate at transonic and supersonic speeds, namely those of providing throughout this speed range, positive and accurate control and stability for gun-firing and weapon-launching.

In its first form the D.H.110 had unassisted rudders, fully-powered ailerons without feed-back, an electrically operated V.I. tailplane and an elevator with hydraulic boost and feed-back. The presence of feed-back here means that control surface actuation is only power-assisted so that a proportion of the surface load is fed back directly to the pilot's controls, providing a measure of "feel." At this stage in development both the ailerons and elevators had provision for reversion to manual control should there be a complete failure of both hydraulic systems.

Early flight-test experience, however, soon revealed the now well-known limitations of a trimming tailplane at transonic and supersonic speeds where elevator power alone was insufficient to carry out more than very limited manœuvres; and the use of the trimming tailplane as the principal pitching control was unsatisfactory for gun-sight tracking because the fixed rate of application of g, being dependent on the speed of the electric trim motor, was too slow. At the same time the power-assisted elevator with feed-back, although it gave good "feel" and light control in subsonic aircraft was found to be undesirable in the D.H.110 because the amount of boost required at the higher speeds dictated a unit whose power was excessive for the low-speed case and destroyed the pilot's "feel" in this condition. Neither did it provide an alternative in case of failure of the hydraulic supply at high Mach numbers when the stick forces would be too great to permit manual control.

For these reasons, and in order to provide adequate pitching control at very high speed, it was decided to develop and fit a fully-powered all-moving tail. There is, of course, no method of moving this type of tailplane manually because of the high forces involved; and the only safeguard against hydraulic failure is through full duplication and partial triplication of the entire control system. Having accepted this principle for the tailplane it was logical to apply a similar system to the aileron circuit and to abandon, there also, reversion to manual control.

Power for the control system on the D.H.110 is supplied by hydraulic pumps mounted on a common gearbox driven by independent free-wheeling shafts from each engine; failure of an engine therefore has no effect on the hydraulic supply. Each control surface is operated by duplicated hydraulic jacks. Because of weight and space considerations these jacks are constructed as tandem units each half of which is supplied by one of the fully-duplicated hydraulic power supplies. Failure of one supply does not demand any action by the pilot to change to the other system; he is merely advised of a failure by warning lights in the cockpit. In the event of a double "flameout"—a condition which is likely to occur only through lack of fuel—a third and independent hydraulic supply can be produced by a retractable "windmill" pump with sufficient output to maintain control for a landing or ditching.

A new expression which has joined the aeronautical vocabulary in post-war years is "Dutch roll." In simple terms this can be described as a simultaneous oscillation in both roll and yaw which occurs during certain conditions of flight. It is a characteristic which is accentuated in swept-winged aircraft and has to be corrected in the interests of operational efficiency. The fin area of an aircraft is dictated by such considerations as spin recovery and directional stability at high and low speeds and is not necessarily the optimum for every condition of flight. There are obviously circumstances for which it is not ideal; and it is when these arise, particularly at high angles of attack, that "Dutch roll" occurs. As in other modern aircraft this effect is present in the D.H.110 during certain conditions of flight and, although it can be corrected by the pilot, it would be a potential source of fatigue were it not eliminated automatically in the control system. This, in the D.H.110 is accomplished by an autostabilizer in the rudder circuit.

Although autostabilizers working through the servo-tabs of unassisted rudders were successful in overcoming "Dutch roll" in earlier aircraft, greatly improved autostabilization became possible when, at a later date, fully-powered rudders were introduced, bringing the rudder control into line with the tailplane and ailerons. The autostabilization system, which is in constant operation during flight, greatly improves stability for gun-firing and weapon-launching as well as correcting "Dutch roll."

Once feed-back has been eliminated in all three axes of control it becomes necessary to provide satisfactory artificial "feel" for each control throughout a wide speed, Mach number and altitude range. In view of the inherent simplicity and reliability of springs it was decided to use these as the basic "feel" contribution of the 110 and to correct the "feel" by additional mechanical devices when the spring system alone was inadequate. The stick-to-tailplane and stick-to-aileron gear ratios were chosen to give correct and comfortable aircraft response within the speed and Mach number ranges most commonly used during operational flying. The rudder "feel" spring has a simple aerodynamic or "Q" force addition which demands an increase of force proportional to the square of the increase in speed. Very heavy pedal-pressure is required to apply even small rudder angles at high speeds, but very little additional force is needed for spin recovery and low-speed flying.

The aileron spring "feel" system has proved straightforward and satisfactory and the aircraft is capable of exceedingly fast rates of roll subsonically, transonically and supersonically, with pleasantly light stick forces. But because of the stick-to-aileron gearing which, as stated earlier, has been adjusted to suit the higher speeds, the stick movements required during an approach —particularly in rough air—were considered undesirably large and the 110 incorporates a pilot-operated gear-change which reduces the stick movement necessary to apply the large aileron angles called for in these conditions.

A small g-weight, or bob weight, which progressively increased the total force required as g was applied was fitted to the tailplane spring "feel" mechanism; but, whereas the stick force was then satisfactory in all conditions, the stick movement per g was excessive above Mach 1.0 where a given aircraft response calls for greatly increased tailplane movement. An automatic gear-change has been fitted which approximately doubles the stick-to-tailplane gearing as the aircraft passes through Mach 1.0. With this operating the 110 is pleasantly manœuvrable at any attainable supersonic Mach number. Just as the lateral stick travel became excessive at approach speeds, so the fore-and-aft travel tended to become somewhat greater than the optimum and the gear-change apparatus which is used to change the ratio at high Mach numbers is also employed to change the gearing automatically when the undercarriage is lowered.

At low approach-speeds the stick is trimmed back a considerable distance to give the necessary tailplane angle and it was found that the full control movement during the landing run was obstructed by flying kit and harness quick-release boxes. To overcome this a stick datum change mechanism has been fitted and this moves the control column forward some two or three inches to a more comfortable position without altering the tailplane angle. This is done automatically as the flaps reach the fully down position; the stick automatically reverts to its normal position as the flaps retract.

Some confusion exists at present about the functioning of the D.H.110's all-moving tailplane because, at first sight, the horizontal tail has the appearance of a conventional trimming tailplane with elevator. The tailplane of any aircraft must create a download in order to provide equilibrium. In normal flight the D.H.110 tailplane acts as a single control surface which can be moved by the control column or trim control to vary the download and thus manœuvre or trim the aircraft in the pitching plane. The hinged trailing-edge is locked in the neutral position except when it is required to increase the available lift co-efficient, as is necessary for instance at very low speeds used during approach and landing. This method of using the hinged trailing-edge in a similar manner to a wing flap system has been adopted by the designer to serve two important functions. In the first instance it is used to correct the trimchange caused by flap extension. The D.H.110 is equipped with large Fowler-type flaps which, but their rearward movement, substantially increase the wing area in the landing configuration—a particularly useful feature for a swept wing. But they produce a nose-down trim change which is undesirable in an all-weather aircraft, and the trailing edge of the tailplane therefore moves automatically upwards as the flaps extend, increasing the download and cancelling out the trim change. In addition, the hinged trailing edge has been arranged to act as a geared flap whose deflection relative to the tailplane increases as the tailplane angle itself is increased. Because this gives the tailplane greater effective camber and, therefore, produces greater download, an improvement in pitching power at low speed results. With the aerofoil section thus corrected for better qualities at low speed, a considerable improvement in control power is attained under these conditions with the added advantage that large tailplane angles can be used at low speeds without risk of the tailplane stalling.

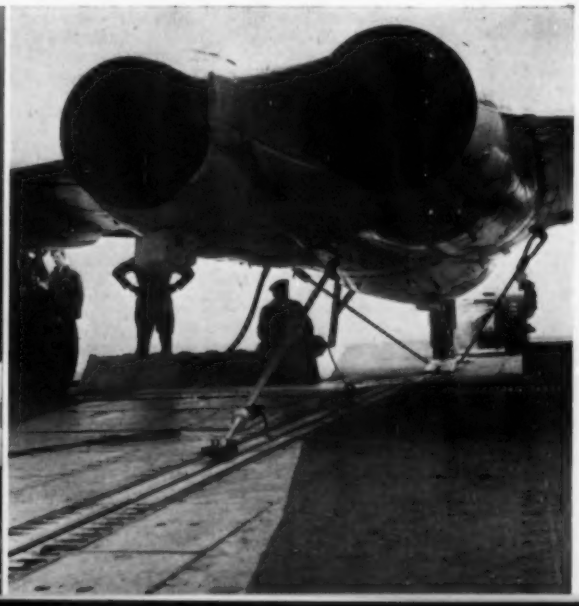
An automatic pilot is an obvious advantage in an all-weather aircraft because it relieves the human pilot of the need for concentrating on instrument flying during un-accelerated flight such as climb, patrol and descent. For this reason a two-axis autopilot has been fitted. This allows the pilot to select climb, constant altitude or descent, and to perform low-rate turns in the cruising or stacking pattern. Since the ailerons of the D.H.110 are well aft of the centre of gravity they have been adapted as autopilot elevons to give both pitch and roll control from a single control surface. Further complication of the tailplane control system is thus avoided and the danger from autopilot malfunctioning is limited. Being a two-axis autopilot turns are unco-ordinated, but the amount of rudder used on this type of aircraft is so small that the ensuing yaw is unnoticeable.

This flying control layout may at first appear complicated, but it is emphasized that this method of power control and its corrective devices are essential to satisfy the very demanding requirements of a deck-landing high-speed aircraft of this size which is intended for operation in weather conditions which a decade ago would have grounded even land-based defensive fighters. Inherently simple and reliable mechanical systems are used in this layout and, except for the pilot-operated aileron gear-change, they are fully automatic. Variations in response and "feel" with changes of speed and/or height are thereby minimized and the pilot can fly with the very high degree of accuracy required.

The D.H.110 which completed carrier trials (as reported in *Flight* on May 4), has now returned to the Christchurch factory where further development flying is taking place. Meanwhile work proceeds apace on the production aircraft which will have power-folding wings, the new pointed radome illustrated last week, a long-stroke undercarriage and nosewheel steering.

Not only the control system has lately been under development, and accompanying pictures show the catapulting arrangements which were successfully tested during carrier trials aboard H.M.S. *Ark Royal* last April. The D.H.110 was flown on that occasion both by senior Naval test pilots from the A. and A.E.E., Boscombe Down, and by Mr. J. Elliot, chief test pilot of de Havilland's Christchurch factory.

Close-ups secured during the D.H.110's carrier trials: on the left is seen the launching strop and on the right is the hold-back—designed to break under a tensile load slightly greater than the combined thrust of the Avons.



British Executive Flying

How One Big Business House Utilizes its Rapide

By
BRIAN
CARNEY

"EXECUTIVE flying"—the use of company-owned aircraft for the transport of senior staff—has become part of the everyday routine of many large firms in the United States during post-war years. In Britain, executive flying is still little known. That there are serious drawbacks to this form of aviation in the U.K. is obvious: the heavy tax on aircraft fuel makes any form of private flying enormously expensive compared with other types of transport; time saved by flying between two cities may be lost in a traffic snarl on the road from the airport; and as the U.K. is a small island and not a sub-continent it is likely that most businessmen's journeys are of too short a distance to facilitate the economic use of a private aircraft.

But executive flying has its champions even in Britain. One man with a strong belief in the usefulness of company-owned aircraft is Mr. D. C. Maxwell, a director of Ind Coope and Allsopp, Ltd., the large brewing firm with headquarters at Burton-on-Trent. In April this year a D.H. Rapide was purchased from Air Couriers, Ltd., Croydon (through Mr. F. W. Griffith), and Ind Coope's became one of the very few commercial undertakings in Britain to operate an aircraft solely for the purpose of flying directors and managers about their business. A full-time pilot was added to the staff in the person of Mr. D. Lancaster, who until recently was joint owner of a charter company operating from Ringway, Manchester. Mr. Lancaster has spent 3,000 of the 4,400 flying hours in his log book handling Rapides. He is an ex-R.A.F. pilot who joined the Service in 1941, flying Spitfires with the Desert Air Force and Typhoons in the European campaigns. After the war he flew from Croydon with several charter companies before moving to Ringway. His experience has familiarized him with all the major British, European, Mediterranean and African air routes.

The Rapide has been fitted out with modern navigational aids including a Bendix radio compass, two VHF radios and a fan marker. In its modified form, the aircraft carries seven persons and can be operated successfully in marginal weather conditions. It has a cruising speed of 130 m.p.h. and uses 20 gallons of fuel per hour.

The Rapide is based at Burnaston Airport, between Derby and Burton, five miles from the head office of Ind Coope. Trips are made almost daily to destinations as far away as Hornchurch, Alloa, Ipswich, Newcastle-upon-Tyne, Cardiff, Portsmouth, Liverpool and the Isle of Man. Cross-Channel journeys are also flown as the company, through their subsidiary B. Grant and Co., purchase quantities of French wine for their tied and free trade houses. The machine has flown to Germany and Switzerland on engineering business.

It is interesting to note how the aircraft has been dovetailed into the firm's ordinary transport administration system. To ensure maximum utilization, the pilot gets his instructions from only one man, who works in the firm's central office and knows the overall commitments for air travel. If a director wishes to use the aircraft for a flight he asks his personal assistant to arrange this with the central office, and if the aircraft has not already been booked for an important flight on the day specified, the journey is scheduled. This flight will be noted on a duplicated sheet which details the Rapide's flying programme for the coming week, and this is circulated to all other directors and senior staff. Requests to join scheduled flights are then accepted up to the maximum seating capacity. In fact, the aircraft is fully committed through the working week.

After two months' continuous operating the Rapide seems to have proved its worth in no small measure. Mr. Maxwell is an enthusiastic private pilot, and he is confident that the Ind Coope aircraft will prove that executive flying has a place in the business life of Britain. He does not deny that flying of this kind is extremely expensive, but he has figures to show that "cooping top executives in trains for hours on end" is even more expensive; and the Rapide carries several directors, not one, on most flights.

What about delays between airport and business centre? Here again Mr. Maxwell is more optimistic than most. He claims that many people base their ideas of excessive delays on their experience when flying between large civil airports, such as London and Ringway. But, as he points out to non-flying friends, there are about 130 civil aerodromes suitable for the reception of small aircraft in this country and 50 R.A.F. fields which can be used with permission. Many of these airfields are almost as accessible to business centres as the local railway stations. There are few large towns in Britain which do not have a landing field within five miles.

Even when flying between big cities, careful co-ordination of transport arrangements can ensure a valuable saving in time, says Mr. Maxwell. If possible he arranges for the executive with whom he is to confer to meet him at the airport, so that time spent in driving to the office can be utilized for the preliminary discussion which is essential before most decisions are taken.

It is becoming commonplace for Ind Coope directors to have a daily routine such as this:—8.30 a.m., arrive at the Burton-on-Trent head office, read through correspondence and dictate replies; 10 a.m., leave for Burnaston Airport; 10.15 take off for (say) Manchester; 11 a.m., arrive Manchester for conference and business luncheon; 3.30 p.m., take off from Manchester for Burnaston; 4.30 p.m., leave Burnaston for Burton; 4.45 p.m., arrive back at head office in time to sign letters and dictate any material connected with the conference.

Apart from the time-saving factor in using company-owned aircraft, there are other economic advantages. Hotel charges—normally a very heavy item in travelling expenses—are almost eliminated. Return journeys from the extremities of the British Isles can be accomplished without an overnight stop. There is no need to have breakfast and dinner away from home.

It is likely that other firms with a structure similar to Ind Coope and Allsopp will study the executive flying experiment with care. Ind Coope are, in many ways, an ideal firm for this project: their business interests are spread over a wide area with depots and agencies throughout the country. Most of the depots and agencies have adequate road transport facilities and there is no difficulty in arranging for cars to meet the Rapide at the nearest airfield.

The business is large enough for its directors and senior staff to be sufficiently well paid to make the value of the time saved by personal air transport greater than the cost of flying. There is full utilization of the aircraft because there are enough air-minded people within the company to support the scheme and thus spread the overhead charges.

The possibility of laying down small airstrips in the vicinity of the larger Ind Coope depots has not been ruled out as a future plan to improve even more the efficiency of the executive flying service. As such runways would obviously be very short, this possibility suggests a useful field of investigation by the manufacturers of aircraft with very short landing/take-off characteristics.

Although this is the first time Ind Coope have had a full-time pilot on the staff of the company, Mr. Maxwell has been piloting himself on business trips since 1947. In that year he started using his own Auster for business purposes, flying for the most part from a private runway in the grounds of his home, Bosworth Hall, Husbands Bosworth, Leicestershire.

Mr. Maxwell was able to demonstrate that if all his business travel was done by train or car, more than one month in every year would be spent actually on the move from place to place. By flying he showed he could travel 20,000 miles annually and the time taken would amount to only 150 hours. Now he has gained the backing of his board; some of his colleagues admit to enjoying the switch from land to air transport—others regard it as a necessary evil, but at least they accept it.

Ind Coope are giving a lead in the most neglected field of aviation in this country; just how neglected, as compared with the United States, can be judged from a recent American novel which records—apparently without irony—an argument between a Texas oil tycoon and his wife. He tells her she will have to be satisfied with the twin-engined aircraft for her shopping trip—as he needs "the big aeroplane" for executive flying.

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An AN-2 skiplane seen at Mirny, Antarctica, loading supplies from the Russian polar expedition's flagship "Ob."

First Details of a Sturdy Russian Worker

ANTONOV AN-2

THE considerable demand for simple, rugged aircraft—of the type exemplified by the D.H.C.-2 Beaver—to operate under extremely variable conditions with an assortment of payloads, is reflected in the design of a Russian biplane—the AN-2.

Its designer, O. Antonov, made his name in the U.S.S.R. during the early 1930s with his sailplane and cargo-gliders, and his A-9 and A-10 single- and two-seat high performance sailplanes are at present widely used by Russian gliding clubs.

The first powered aircraft designed by Antonov was the SCH-1 which appeared at the beginning of 1950 and was intended mainly for agricultural work. (SCH-1 in fact, stands for Sjelsko-Chozjajstwjenny-1, a rough translation of which is "for agricultural and domestic purposes.") His second aircraft design, AN-2, followed shortly afterwards and proved to be an outstanding success for which he was awarded a Stalin Prize of 100,000 roubles.

The AN-2 biplane is suitable for operations in under-developed areas, where only improvized airstrips, or even unprepared ground, such as clearings in woods or country roads, are available. Testing has been carried out in arctic and tropical conditions. Now in large-scale production, the aircraft is replacing Po-2s which are being retired after nearly 30 years of continuous service. Several versions of the AN-2 are in use by Aeroflot for communications, transporting cargo, photographic air survey and agricultural purposes. Extensive military use of the aircraft is made for paratroop training, as well as, to a lesser extent, liaison and V.I.P. transport work. There are also rescue and ambulance variants.

Its crew consists of a pilot and navigator and accommodation is provided for 8-12 passengers or, in military guise, for 12-14 paratroopers.

Of all-metal construction both wings and tailplane are of rectangular planform with rounded tips. The upper wings are fitted with slots, and both wings have dihedral. The fuselage is of stressed skin construction of basically circular section, tapering to an oval section forward of the integral fin. The tailplane is mounted above the slipstream and is supported from the fuselage by two struts. Access to the cargo stowage space between the mainplanes is *via* wide cargo doors on the port side, and the cabin is provided with eight porthole-style windows with an additional window in one door. The crew compartment is placed well forward of the wings to give good visibility at high angles of attack on the landing approach. A non-retractable undercarriage (skis or floats can be interchanged if required) gives a large ground clearance, and soft shock absorbers enable safe three-point landings, with open slots, to be made. A fixed tailwheel is fitted.

Alternative powerplants are the seven cylinder air-cooled single-row radial ASz-21 producing 750 b.h.p. at 2,300 r.p.m. for take-off (max continuous cruising rating 690 b.h.p.), or the ASz-62 JR 1000 b.h.p. engine, both of which were designed by Shvetsov. Both units drive a peculiar crescent-shaped four-bladed variable-pitch airscrew.

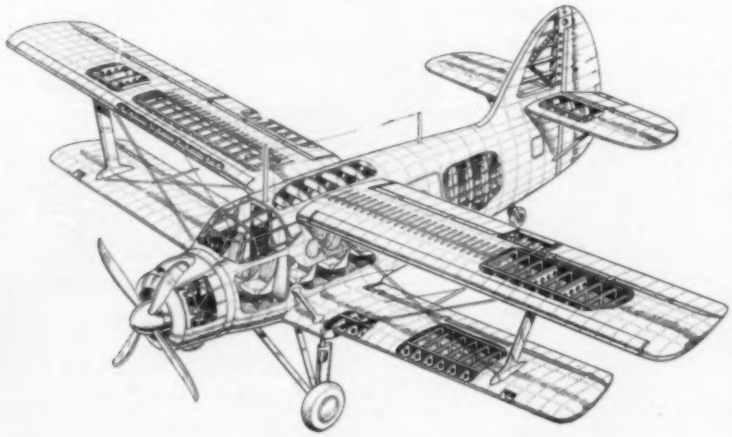
The AN-2 is equipped for all weather and night flying—the cockpit and cabin are lit and heated, flares are carried, and for night landings two "searchlights" are built into the leading edge of the lower mainplane. Fully duplicated controls are also provided. An aerial may be seen to stretch between two short masts, one immediately aft of the cockpit, the other in front of the fin.

Various special equipment is carried depending on the duties on which the aircraft is engaged—for geodetic survey either two A.F.A.-33/50 or an A.F.A.-33/75 and an A.F.A.-18/21 camera fitted with two semi-automatic range-finders are mounted in the fuselage. The power supply is provided from the standard D.C. system through a rotary converter. For geophysical prospecting the plane carries Geiger-Müller counters and magnetic field strength meters with associated electronic locating equipment. Other equipment consists of a radio-sonde, altimeter, two compasses—a master compass A4 and course indicator K1-11—and an ambient air thermometer.

The agricultural version is equipped with 200 Imp. gal capacity tanks for spraying liquid fertilizers; an M-600 pump driven off the D.C. supply, and a spraying manifold with nozzles. It is also frequently fitted with a small portable band-conveyor which cuts down the loading time of mineral fertilizers from ten minutes to less than three. For the passenger and liaison version the seats are easily detachable, thus increasing the utilization of space when carrying mixed cargoes. A special self-propelled crane has been designed for this version in order to speed up the cargo loading time to three or four minutes instead of about 20-30.

The AN-2 has established a record for group parachute jumping, when a group of six jumped from 24,547ft, and set up an "international maximum ceiling record" of 36,893ft.

Antonov's latest design is a twin-turboprop high-wing transport, seen at the Tushino display on June 26.



Dimensions: Span, 46ft 9in; length, 37ft 1in; height, 15ft 5in.

Alternative Version: Span, 54ft 1in; length, 35ft 5in.

Weight Loaded: About 8,818 lb (alternative versions, 11,023 lb); useful load, 3,086 lb.

Performance: Max speed, 153.3 m.p.h.; max speed at 6,889ft, 136.7 m.p.h.; cruising speed, 90.7-111.8 m.p.h.; min. speed, under 43 m.p.h.; fuel for six hours of flight is carried; range, 671-745 miles.

CORRESPONDENCE

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns; the names and addresses of the writers, not for publication in detail, must in all cases accompany letters.

The D.H.9A referred to by Mr. J. T. Bennett.

Twin Pioneers

WRITING in the May issue of *Travel World*—the leading U.K. travel agents' magazine, which has considerable circulation throughout the Commonwealth—W. D. C. Cormack states that the managing director of Scottish Aviation told him that firm orders have already been placed for "about 200" Twin Pioneers for "operation in countries all over the world" (to quote the author's actual statement). Since the article in question was almost completely devoted to the merits, etc., of the Twin Pioneer, it seems to me that this report must have had the official blessing of Scottish Aviation themselves.

I should like to point out that *Travel World* is usually regarded by U.K. and Commonwealth travel agents as a reputable journal, and is furthermore noted for the high standard of its articles and other reports on air, land and sea transport.

Despite the obvious merits of the Twin Pioneer as an almost revolutionary type, it is clear to anybody who knows anything at all about the aircraft industry that sales figures of "about 200" are carrying wishful thinking to the extreme, for the next year or two at least.

The fine report published in *Flight* on November 25, 1955, "Twin Pioneer in the Air," by your Editor, clearly states that Scottish Aviation eventually hopes to build and sell "at least 100." Since this report was published and at the time of writing, small orders for the type have been officially announced, including six for Scottish Airlines, two for West Norway Airlines and an undisclosed number for the R.A.F. (the last-named according to the June issue of the *R.A.F. Flying Review*). In addition, the makers have recently announced they will initially build 15 of the type, and already the civil registration letters of G-AOEN to G-AOER have been allocated for the first four aircraft. I am sure that most readers will agree that the later figures are very different indeed from those quoted in Mr. Cormack's report.

One feels that exaggerated claims may do untold harm to this thoroughly promising new British aeroplane, which would indeed be a great pity for all.

Nairobi, Kenya. DENNIS M. POWELL.

[Mr. D. F. McIntyre, managing director of Scottish Aviation, Ltd., is of the belief that Mr. Cormack misunderstood his remarks concerning Twin Pioneer production. In any case, he says, the company has refrained in principle from mentioning the orders it receives, considering that such announcements should be left to the purchaser. "We have merely stated," he adds, "the fact that the production quantity of 100 aircraft, as initially planned, was increased to 200 and that we are confident that this quantity will fall short of the demand for Twin Pioneer aircraft."—Ed.]

Flight-refuelling Airliners

IN his reply to my letter, L. F. E. Coombs, asking why airlines don't use flight refuelling (*Flight*, June 15), produces a number of difficulties but doesn't offer any solutions for overcoming them.

Yet the U.S.A.F. must have overcome them to enable them to have adopted flight-refuelling in such a big way. Does Mr. Coombs believe that what the Yanks can do we can't?

Civil aviation can often learn from military aviation. When the Berlin airlift of 1948-49 demonstrated how intensive traffic could operate safely in most weather, another member of the 'It-can't-be-done brigade' said that civil airlines could never have the discipline of the R.A.F. and U.S.A.F. Yet many of the aids which made the airlift such a success are now a matter of course in civil aviation.

Difficulties are there to be overcome by human ingenuity, and the nation or individual which does not overcome them must fall behind in the race to succeed.

London, S.W.3. GEOFFREY DORMAN.

Australia's Historic Lancaster

WITH reference to Mr. G. B. Ducker's letter (*Flight*, June 8), Lancaster "G for George" was taken on the strength of No. 460 Squadron at Binbrook on October 22, 1942, and recorded her first "op." with a trip to Mannheim on December 6, 1942. F/Sgt. J. A. St. Smith did, I believe, 13 trips in her. He was awarded the D.F.M., commissioned, and won the D.F.C. on Mosquitoes before being killed on June 29, 1944.

G for George was the first away to Berlin on January 16, 1943, with a war correspondent aboard, and came back with 13 flak holes in her. On June 16, 1943, she came back from Cologne with 17 flak holes. F/Sgt. W. A. Watson took her to Kassel on October 22, 1943, on her 67th operational sortie. Her last trip was to Cologne on April 20, 1944.

"George" was serviced throughout her career by F/Sgt. H. Tickle, and I think it was calculated that she had flown 664 hours 5 mins operationally.

Bridlington, E. Yorks. J. L. DIXON.

The D.H.9A

WAS Mr. Maurice Austin's D.H.9A which carried a spare wheel (*Flight*, June 29) a civil or military aircraft? In any case, here is a military 9A—complete with spare wheel. This particular aircraft landed in soft ground and turned turtle.

Darlington, Co. Durham. J. T. BENNETT.

Recognition Problem Solved

WITH reference to the letter (June 29) from Mr. Colin M. T. Lamb, I also saw the twin-engined high-wing monoplane over N.W. London on June 14. He states that it was not a Miles Aerovan, but I was able to identify it definitely as one.

New Barnet, Herts. J. M. WILDE.

THE aircraft referred to by Mr. Lamb was Miles Aerovan G-AJKP (registered in the name of the makers).

London, W.5. D. C. BELINFANTE.

FORTHCOMING EVENTS

June 29-July 13. World Gliding Championships, St. Yan, France.
July 14-15. Aero Clubs of Trento and Bolzano: Eighth International Tour of the Dolomites.
July 14-15. Dusseldorf Aero Club: Air Rally.
July 14-25. International Gliding Competition, for the Coupe Jacques Coeur, Bourges.
July 15. Royal Belgian Aero Club: International Gliding Competition, Namur.
July 15. R.Ae.S.: Garden Party, Wisley.
July 18-22. Venice Aero Club: International Aeronautical Exhibition.
July 21. R.Ae.C.: National Air Races, Third Round (including King's Cup Race), Baginton, Coventry.
July 21. R.N.A.S. Lossiemouth: At Home.
July 21. R.N.A.S. Anthorn: At Home.
July 22. Northamptonshire Aero Club: At Home.
July 22. Yorkshire Aeroplane Club: At Home.
July 28. R.N.A.S. Yeovilton: At Home.
July 28. R.N.A.S. Culdrose: At Home.
July 28. Helicopter Association: Rally and Garden Party, Ripley.
July 28-30. Livorno Aero Club: Air Rally.
Aug. 1-12. Central Aero Club of U.S.S.R.: World Parachuting Championships, Moscow.
Aug. 4. R.N. Air Station Brawdy: At Home.
Aug. 5-6. World Power Model Championships, Cranfield.
Aug. 11. R.N. Air Station Lee-on-Solent: At Home.
Aug. 17-19. Sportsflyveklubben: International Rally, Denmark.
Aug. 25-26. Midland Aero Club: International Rally, Elmdon, Birmingham.
Sept. 3-9. S.B.A.C. Display, Farnborough ("Public" days, 7th, 8th, 9th).

THE INDUSTRY

Herald Ambassador

AN extensive tour of Africa is being undertaken by Mr. R. S. Sowter, a member of the sales department of Handley Page, Ltd. He is visiting airline operators in thirteen countries to discuss their requirements, with particular reference to the Herald, designed specially for branch-line air services of the type frequently encountered in Africa. Mr. Sowter's tour will cover countries as far apart as French Morocco and Mozambique and will include Angola, Ethiopia, Nigeria and Liberia. Handley Page, Ltd., believe that the Herald is of interest to nearly every part of Africa and are anxious to study operating conditions on the spot.

Joining Avro Aircraft

FORMERLY with Bristol Aero-Engines, Ltd., where he was working on helicopter ramjets, Mr. P. R. Payne is leaving to join Avro Aircraft, Ltd., of Toronto, at the beginning of August. Mr. Payne started work on helicopters in 1949, when he joined the Bristol Aeroplane Company's Helicopter Department as an aerodynamicist. Later he became a project engineer and in this capacity, in 1952, went to the Saunders-Roe Helicopter Division. In 1953 he joined Auster Aircraft, Ltd., as chief project engineer and was responsible to the managing director for all work on helicopters and helicopter ramjets.

Ferodo Film

AN entertaining film, telling the story of Ferodo, Ltd., since its inception, has been made for the company in sound and colour by Screen Audiences, Ltd., of the J. Arthur Rank Organization. The film opens with the lowering of a Viscount undercarriage in the air, seen as background for the credit titles, and closes with its folding up again. There are also shots of the Constellation and Pionair, and of aircraft brake materials under test. Sequences concerned with processes in the main Ferodo works at Chapel-en-le-Frith, Derbyshire, are instructive and pleasant; those concerned with aircraft, racing at Goodwood and Le Mans. road vehicles, and the English countryside give the film wide general interest.

Copies (either 16 mm or 35 mm) can be obtained for club meetings or other gatherings on application to the Public Relations Officer, Ferodo, Ltd., Chapel-en-le-Frith, Stockport, Derbyshire. Commentaries are available in several languages.

Light Sleeper

RECENTLY the aircraft division of Microcell, Ltd., of 56 Kingsway, London, W.C.2, demonstrated an aircraft seat which, though adjustable from the near-upright to the fully reclining (in which position it makes a comfortable sleeping-berth), is of unusual lightness.

The "first-class" version has a seat width of 21in, its back can be adjusted between 16 deg and 68 deg to the vertical, and berthing is effected at any pitch between 39in and 50in. Total weight is only 67 lb.

The tourist version, with 17½in seat width, is made in double and triple form and can be reclined by armrest controls from 12 deg to the vertical through 4-deg stages to 40 deg. Both seats are stressed to 9g and can be used in conjunction to make first-class and tourist accommodation possible in the same aircraft.

D.H. Propellers Appointment

IT is announced that Mr. H. R. Leather, A.F.R.Ae.S., who has been chief development engineer of de Havilland Propellers, Ltd., since 1950, has been appointed chief designer. In his new position he will be responsible for all airscrew design work and for the technical control of development. Mr. Leather joined de Havilland in 1939 as a fitter in the propeller experimental department, which was then housed at the Stag Lane factory in Edgware. In 1943 he became a technical assistant, and later moved to the propeller development department. He was made chief development engineer in 1950. Mr. Leather has been responsible for implementing the development programmes of all de Havilland airscrews now building and of the company's new work on guided weapons, turbo-alternators, cold-air units and radar scanners.

Mr. Leather.

Vickers Changes

A NUMBER of changes in the Vickers, Ltd., senior-executive organization took effect on July 1st. Details are as follows:—

Mr. A. H. Hird, A.C.G.I., B.Sc., M.I.Mech.E., is appointed a special director of Vickers, Ltd., and adviser on group commercial engineering sales. He also takes over the chairmanship of A.B.C. Motors, Ltd., of Cooke, Troughton and Simms, Ltd., and of Ioco, Ltd. Mr. Hird remains on the Board of Vickers-Armstrongs, Ltd., as engineering sales director, and on the Board of Vickers-Armstrongs (Engineers), Ltd.

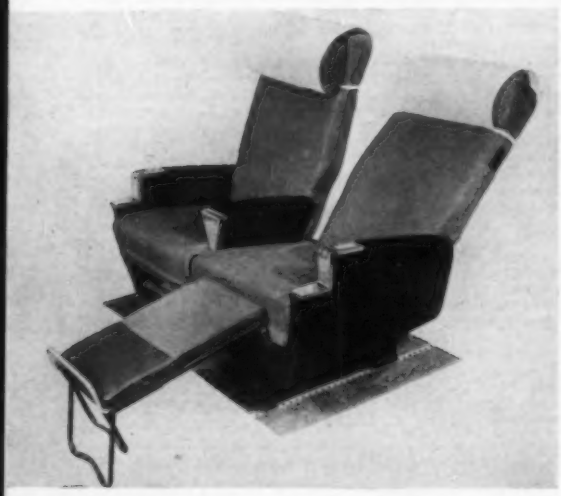
Mr. E. J. Waddington, A.C.A., and Mr. R. P. H. Yapp relinquish their seats on the Boards of Ioco and Cooke, Troughton and Simms, and Mr. Waddington relinquishes the chair of A.B.C. Motors, but remains on the Board of that company.

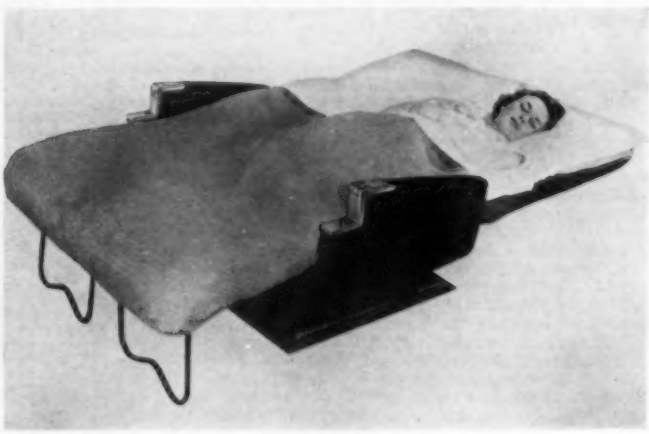
Mr. R. Wonfer is appointed to the Board of Vickers-Armstrongs (Engineers) as sales director.

Mr. J. E. Richardson, O.B.E., is appointed a director of Vickers-Armstrongs (Engineers), retaining his existing office of deputy general manager and engineering manager, Barrow works.

Rear-Admiral Sir Anthony Buzzard, Bart., C.B., D.S.O., O.B.E., is appointed a special director of Vickers-Armstrongs, Ltd., and assistant to the managing director.

The Microcell seats in their first-class (left) and sleeper versions.





Civil Aviation

A Plan for European Air Transport

Two Needs: Greater Intensity of Operations and Reduced Costs

THAT there is considerable room for improvement in the economic health of European air transport is one of the facts of present-day life, and the prescription of a remedy constitutes the task which a young economist-philosopher has set himself. "Have you read Wheatcroft?" is a question which will be asked not only of those concerned with the management of European air transport, but of its aeroplane-suppliers also. This book presents the analysis, conclusions and recommendations of an airline man who withdrew from the day-to-day details of administration, took in a deep breath, and set about the formidable task of examining from first principles the European problem as a whole.

The industry's economic problems, in a nutshell, are to be found in the natural handicaps to European air transport, in the present political system of economic regulation, and in certain internal failings. Mr. Wheatcroft separates and examines each of these three problems. He suggests that it is the over-extension of the European air network which is a fundamental cause of the economic trouble, and his constantly recurring thesis is for greater intensity and higher frequency of operation, and for the use of larger aircraft. Although short routes are the inherent feature of the European business, the low intensity at which they are operated is capable of regulation. The fact that three-quarters of Europe's daily seat-miles are operated on sectors of less than 500 miles emphasizes the short-haul nature of the industry. It has been suggested that, because of this, it must be basically less economic; but is this really so?

Mr. Wheatcroft shows that many of the apparent difficulties arise from inadequate exploitation of the potential advantages of short-haul operation. He produces the evidence to show that traffic flow varies inversely with the length of haul, and indicates that the traffic potential of a short-haul route of, say, 250 miles justifies the use of an aeroplane twice as large in payload capacity as the long-haul route of 2,000 miles—a conclusion which is a complete reversal of present concepts. (The Vickers Vanguard is perhaps the most notable exception, and it is illuminating to follow the reasoning which undoubtedly led to the creation of this aircraft.)

Large aircraft such as the DC-6B are used in Europe for competitive reasons, but, being designed for long-haul work, the percentage of their total potential payload that can be used over short stages is low and therefore uneconomic. The most surprising point that emerges from a comparison of the aircraft at present used in Europe, however, is that even those designed for medium-haul work—Viscount and Convair—are not able to use their full potential payloads over the 500-mile sector lengths below which the majority of European traffic is carried.

One of short-haul air transport's most difficult cost problems is the high incidence of station costs: on European short hauls this may amount to about a quarter of total costs, compared with about one-tenth on long-haul networks. But is this an inherent characteristic of short-haul operations? The author suggests that it is more the result of the political framework of Europe's air transport —the "spoke" pattern of its routes with the low utilization of the periphery stations—which could be intensified by joint traffic-handling. And the benefits of high intensity, once achieved, offer the possibility of improvements in other directions—reservations, ticketing and accounting being examples. Most of all, perhaps, would high intensity benefit aircraft load factors.

The oft-discussed question of the relationship between size and efficiency in an airline makes the book's detailed study of the results of U.S. domestic airlines of special interest. It shows that the economies of large scale in airline operation tend to flatten off beyond the size of the medium-haul airlines, i.e., those producing of the order of 150 capacity ton-miles per annum. After this point the economies of large scale become offset by the increased cost of executive management. The question whether Europe is being served by airlines that are too small makes comparison with the U.S. inevitable, and this—with reservations for the fundamental differences that exist between the two areas—Mr. Wheatcroft has done. His conclusion is that the European airlines which carry the majority of traffic are in fact sufficiently large to be able to enjoy the anticipated economies of large size. So far as the other smaller airlines are concerned, there seem to be strong reasons for advocating the maximum of technical co-operation, if not of actual merging.

What of the various proposals for the creation of a single European airline? The author disposes of them briefly. Such an organization would be so large that the "diseconomies" of size from the point of view of management would be serious; while it might be able to rationalize the route system, such an issue is best decided by a public authority and not by an operating company. Most of all, perhaps, there is "the social desirability of reducing concentrations of economic power, on providing as many alternative sources of employment as is possible . . . and the most numerous opportunities for individual initiative."

It is because short-haul operations are most profitable when they are at the highest intensity that Europe's violent seasonal variations are one of the industry's biggest problems. The author suggests one of the answers may be found in a big-capacity short-haul aircraft which is capable of carrying that capacity over short hauls, and which has in addition a cargo-passenger flexibility to enable it to be filled up regardless of passenger variations. (Here again, one detects the philosophy behind the Vanguard.) Another way to ride the seasonal peaks might be found in the imaginative transfer of staff, a system already successfully worked by Aer Lingus. But the essential fact is that the costs of meeting peak demands are higher than those of meeting off-peak demands.

The controversial case for seasonal fares rests upon this fact. The author examines the evidence for and against, and returns a verdict in favour. Differential fares would of course complicate further Europe's already highly complex pattern of air fares; but the suggestion is that, kept within reasonable limits, they would help pay the extra cost of providing peak capacity as well as encouraging greater intensity of off-peak travel—the overall effect being a reduction of costs and therefore of fares. But is there a possibility of an approach being made, as it is to be on the Atlantic, to an altogether different market? An analysis of the development of European air fares shows that today they may be deemed to compete satisfactorily with second-class surface fares; but it is the large volume of untapped third-class traffic which presents a real challenge to the European airlines. The dilemma is that although present fares only just compete with second-class surface rates, they are still barely adequate for economic self-sufficiency.

The answer, in Mr. Wheatcroft's view, is not to price oneself out of the market; the first move is to reduce operating costs; and he turns again to the U.S. domestic airlines for a datum comparison. While this is fraught with objections about the different conditions prevailing, the conclusion that the European cost level is some two-thirds greater than the American level strongly suggests that there is room for improvement. What are the reductions that could be made?

The author examines a number of items, some dependent upon the policies of government authorities, others upon the airline managements. His conclusion is that reductions of up to 30 per cent are conceivable.

Government action to slow down the expansion of route mileage, or even to reduce it, would increase the intensity of operations, or the capacity ton-miles per mile. Use of aircraft offering higher capacity ton-miles per hour could reduce flying operation costs by 25 per cent, representing a six per cent reduction in *total* costs. Increased density of the market might bring about a reduction of promotional costs, representing two per cent of the total. Rationalization of the route system, especially if it were followed by joint traffic handling agreements, could lead to higher station utilization: if this were doubled, a four to five per cent reduction could follow. Complete V.H.F./R.T. coverage in Europe would allow two-pilot crew operations, resulting in at least a four per cent reduction.

So far as internal airline policies are concerned, reductions in the costs of maintenance and overhaul (60 per cent higher than U.S. costs in 1952) amounting to one-third, or six to seven per cent of the total, should be aimed for. An increase in aircraft utilization from 1,800 hr to 2,400 hr per annum could bring about a further three to four per cent cut.

Thus a total reduction of some 30 per cent could be achieved, mainly as a result of economic regulation that would create the conditions of *intensive* expansion. The means by which this economic regulation could be achieved forms the final part of Mr. Wheatcroft's book, and will be the subject of a review in our next issue. J. M. R.

MR. STEPHEN WHEATCROFT is economic planning consultant to B.E.A., having formerly held the post of commercial research and tariffs manager. He was for two years chairman of the Fares and Rates Committee of the I.A.T.A. Traffic Conference. His book,* the first part of which is reviewed here, is the result of his work at Manchester University as a Simon Research Fellow, and is undoubtedly the most valuable judgment of the complex problems of European air transport yet offered. Its publication happens to coincide with the news earlier this week of a continued downward trend in B.E.A.'s operating costs. Although not as great as last year's decrease (3.47 per cent compared with 12.2 per cent), the 1955-56 cost per capacity ton-mile was reduced to 40.3d. This represents a 52 per cent decrease since 1947.

**The Economics of European Air Transport, by Stephen Wheatcroft, Manchester University Press, 35s.*

CIVIL AVIATION . . .

GOOD CAPITAL INVESTMENT

CAPITAL Airlines have just issued an illuminating comparison between their estimate of Viscount costs made in May 1954 with actual operating results over the first nine months (during this period—July 1955 to April 1956—the fleet built up from three to nineteen aircraft).

The outstanding result is that break-even load factor works out at 56.8 per cent. Main items from the comparison are tabulated below. Obviously, when utilization increases to the planned 8.5 hr (it is already eight hours), both direct and indirect costs will fall; both depreciation and overheads will drop, although maintenance will rise as the full maintenance cycle is reached. It is likely that total operating cost will stabilize at 150.5 cents per mile compared with the higher estimate of 154 cents on which the aircraft was ordered. Capital reckon that the break-even load factor will level out from 56.8 per cent to between 53 and 55 per cent; the airline's actual load factors have of course been consistently around the 80 per cent mark.

	Estimate (cents per mile)	Actual (cents per mile)
Flying	40.5	37.0
Maintenance	24.2	16.2
Depreciation	18.4	25.0
Total Direct Costs	83.1	78.2
Indirect Costs	70.9	79.2
Total	154.0	157.4
Utilization (hours per aircraft per day)	8.5	6.5
Block speed, m.p.h.	239	249.4
Break-even Passenger Load Factor	55.2 per cent	56.8 per cent

So far as serviceability is concerned, there can surely be no more remarkable tribute to the Viscount from this point of view than the comparison just made by T.C.A. with its North Stars, DC-3s and Super Constellations, the first two of which have been long established in service. Appropriate figures, which speak for themselves, appear below.

	Viscount	North Star	Super Constellation	DC-3
Delays per 100 revenue departures (April)	2.89	3.9	8.8	.65
Powerplant delays (same basis)	.22	1.5	4.9	.21
No. of featherings	0	7	8	0
Engine hours per feathering	12,226 (no feathering)	3,140	648	11,184 (no feathering)
Unscheduled engine changes per 1,000 hr (over 12 months)	.08	.55	1.92	.36
Passenger load factors (1st-class) (April)	85.7	54.8	81.6	—

Late News: (1) Capital have ordered 15 more Viscounts (400 m.p.h. V.840s), bringing their total order up to 75. (2) T.C.A., by an unhappy coincidence (see above), are reported to have had a Viscount airscrew-blade failure in flight between Chicago and Toronto on July 9. One passenger was killed.

YORK ACCIDENT REPORT

THE fact that pilot error was the cause of the accident to the Scottish Airlines York G-ANSY at Malta on February 18 last is the unqualified conclusion of the Maltese court of inquiry's Report, published on July 6. The circumstances of the accident, which occurred two minutes after take-off from Luqa on a flight to Stansted, England, and in which the crew of five and the 45 passengers were killed, pointed strongly at the time to sabotage. The court, however, rejects sabotage as the cause unreservedly.

The evidence was that, after a normal take-off, black smoke was observed from No. 1 engine, the aircraft drifting to port before climbing in steps at a slow forward speed, in a tail-down attitude. At 700-800ft the aircraft yawed to port towards higher ground. The aircraft continued turning, the port wing dipped suddenly, the turn tightened, the nose dropped, and the aircraft nose-dived to earth in a semi-inverted position.

Examination of the wreckage showed that the failure of No. 1 engine was due to the failure of the boost-enrichment capsule in the carburettor. Engine failure became complete 30 seconds after take-off. The action of the pilot, according to the Report, should have been to obtain flying speed by depressing the nose and flying level; correcting swing by means of rudder; putting the starboard wing slightly down to assist rudder; and feathering No. 1 engine. Faced with the alternatives of either sacrificing speed for height (in view of the rising ground ahead), or *vice versa*, the pilot "made the wrong choice; that is, he sacrificed speed for height."

B.E.A.'s new Midland helicopter feeder service ("Flight," June 1) was opened on July 2 between Leicester, Nottingham and Birmingham. Here at Elmdon after the inaugural flight are (left to right) the Lord Mayor of Birmingham; Lord Douglas; Mr. John Profumo; Mrs. Profumo; the Lady Mayoress of Birmingham; Lady Douglas.

The owners and operators of the aircraft, Scottish Airlines, do not agree with these findings. While expressing appreciation of the care with which the inquiry was conducted, the company states:

"It is felt strongly that, looking to the position of the aircraft immediately prior to the events which led to its fatal dive to earth, some happening must have resulted in mechanical damage to it, or in injury to, or overpowering distraction of, the captain.

"A group of witnesses who were nearest to the scene of the actual crash spoke of seeing flames coming from the fuselage of the aircraft in or near to the region of the flight deck, immediately before the final dive to earth. This evidence appears to have been accepted as reliable on other matters within their sole observation.

"The company feel bound to state that in their view flames of sufficient intensity to be visible from the ground in broad daylight could not be attributed to the outer port engine, as has been done, or to any fire which might be expected to occur in an aircraft in flight within two minutes of take-off. It does appear to them that such flames could only be accounted for by the explosion of some incendiary agent.

"Only such explosion or other extraordinary cause could reasonably account for the last manœuvres of the aircraft which had, before the crash, gained controllable height and was in the hands of a skilled pilot."

METROPOLITAN LINE

THERE were two reasons for Swissair's choice of the Convair 440 Metropolitan: interchangeability of the Pratt and Whitney R-2800 CB16 piston engines with the company's six DC-6Bs, and early delivery. The first reason might, in this Viscount era, have been regarded as old-fashioned had not Swissair already ordered DC-7Cs (Wright engines); having done so to remain competitive on the North Atlantic the airline was unwilling further to extend its engineering economy—already in any case keyed to the Convair 240—by the adoption of new equipment for inter-European services.

The second reason for choosing the Metropolitan—early delivery—needs no explanation; the order for eight 440s (later increased to 11) was placed only nine months before delivery of the first aircraft, HB-IMB *Fribourg*, on June 10. Six will be in service by October, the remaining five by early next year.

We published in our issue before last (pages 846-847) an impression of Metropolitan travel, and suffice it to say that we disembarked at London Airport last week from Swissair's HB-IMB with the feeling that it is not only the catchy name Metropolitan that is going to sell the tickets for this smoother Convair 340. Cabin noise level, in the opinion of the writer, has not been oversold; the extra 400 lb of insulation and the revised muffling of the exhausts have, compared with the noisy 340, kept cabin dbs down to a pleasantly unobtrusive quantity.

Metropolitans are now at work on Swissair's Zurich-Manchester route, and by the end of the month will be on the London-Geneva and London-Basle runs. As they come into service the seven old 240s will be progressively retired (they have been bought by Mohawk Airlines of Ithaca, N.Y.).

FOYNES REVISITED

THE first transatlantic service proving flight was made by the Short flying-boat *Caledonia* between Foynes—across the estuary from Shannon—and Port Botwood in Newfoundland on July 5, 1937. The nineteenth anniversary of this flight occasioned a reunion for the surviving Foynes "old hands," to whom Mr. Crawford Young, managing director of Irish Shell, acted as host at a notable luncheon given at Shannon airport. The reunion also marked the inauguration of a Shell hydrant refuelling system.

This shortest-route flight was a meticulously planned operation, and the culmination of considerable previous ground work. The *Caledonia* covered the 1,900-odd miles in 15 hr 3 min and the Sikorsky S-42B flying boat which made the identical, but west to east, crossing on the same day, was airborne for 12 hr 34 min. Shannon grew from Foynes, but at the storage tanks and village of Foynes history has left little mark—the halcyon era of the transatlantic flying-boat has passed.

CIVIL AVIATION . . .

MORE CORPORATIONS?

A SUGGESTION that this country should have an increased number of airline corporations was made by Air Chief Marshal Sir George Pirie, speaking as chairman of the Air League of the British Empire at its annual general meeting on June 28. He said the council of the League had noticed with concern the steady decrease in world traffic carried by British airlines and considered there should be a careful review of the organization and operation of our overseas route patterns.

"There has recently been some talk of amalgamating the two national Corporations as a means of effecting economies and increasing our competitive strength. The council believe that the exact opposite is much more likely to be the right course," said Sir George. "It may well be that the optimum route mileage for an efficient airline is in the neighbourhood of not more than 25,000 route-miles, as compared with B.O.A.C.'84,963 route-miles. If this be accepted then there would appear to be a strong case not for fewer corporations, but for more." This would enable them to concentrate sales and development campaigns on a narrow front. The idea of an Atlantic corporation operating North and South Atlantic routes is one, in the council's view, worth close examination. When the two national Corporations were set up a clear demarcation was made between short haul and long haul services. In today's changed conditions it might well be that this rigid distinction should be modified and there should be some extension of existing B.E.A. routes. Also it was essential that the Corporations, operating in a fiercely competitive world market, should be able to carry on their business as commercial concerns with the minimum of political interference.

Capt. J. N. Weir, who has been appointed Chief of Flight Operations of B.O.A.C. He will be responsible direct to Mr. Basil Smallpeice, the managing director of the Corporation.

These suggestions were put forward, said Air Chief Marshal Pirie, in the hope that they might be considered "with a view to making a renewed effort to capture a much larger share of the world's air carrying trade."

BREVITIES

THE general secretary of the S.L.A.E., Mr. Peter F. Murray, is visiting Trinidad at the invitation of British West Indian Airways management. In his capacity as authorized agent of the S.L.A.E. employment bureau he will advise the company upon engineering staff recruitment problems.

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Mr. John W. Swann has been appointed B.E.A. passenger services manager at Keyline House, Ruislip, after serving as traffic superintendent at Renfrew for nine years.

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Mr. C. W. Johnson has been appointed to manage the new T.C.A. Birmingham office at Herbert House, 59-71 Cornwall Street, Birmingham.

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Scancopter Service A/S, Oslo, has recently inaugurated a successful Norwegian Bell 47 helicopter charter service. Application for currency to purchase an additional Bell 47 A2 or 47J machine has been filed.

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Two Beavers fitted with oversize wheels for operations from soft surfaces have been delivered to Rutas Aereas Nationales S.A. —the first Canadian-built aircraft to go to Venezuela—where they will be used mainly for air-lifting personnel and supplies.

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Marconi radio stations to provide ground-to-air communication for transatlantic and trans-polar air routes from Europe to North America and the S.A.S. Scandinavia to Tokyo service are to be installed in Greenland. The stations will be located at Prins Christiansund, Dundas, and at the Nord weather station.

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To avoid the necessity of operators having to carry airborne equipment for both the Instrument Landing System and Standard Beam Approach aircraft aids, most S.B.A. installations which are an M.T.C.A. responsibility will be withdrawn by early next year, although the Croydon service will continue until the airport closes.

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A housed conveyor "Aerobridge" has been developed by Lockheed to avoid an intermediate stage in the handling of cargo between loading bays and the aircraft floor. Each end of the bridge spars is mounted on movable dollies independently adjustable between height limits of four and ten feet. A passenger version able to support 120 people is in an advanced stage of design.

It is expected that the first flight of the Lockheed L.1649A will be made in October of this year.

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A manual in English, French and Spanish has been issued by I.C.A.O. to provide a common international training reference for each ground and aircrew licence or branch of aviation service.

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Thai Airways has placed an order for three Lockheed Super-G Constellations to be delivered in the summer of 1957; four aircraft of two previous purchases have been transferred to other airlines.

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A Qantas flight captain—John William Knowling—has created a record for an Australian international pilot by logging 20,000 flying hours. Capt. Knowling started his flying on Gipsy Moths and currently flies Super Constellations.

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Mr. E. R. Knight will take over as the Technical Director Overseas of Australian National Airways when Mr. Norman Croucher takes up the position of managing director of Rosslyn (Holdings), Ltd., a group of textile companies whose head offices are in Sydney.

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A vehicle air ferry service, complementary to the existing Stranraer-Belfast ferry, is to be opened by Silver City on August 3 between Newtownards airport, Belfast, and Ronaldsway, Isle of Man. Bristol 170s will be operated at an initial frequency of one return trip each day.

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The outcome of a protest by the British Ambassador in Athens over the "buzzing" of a B.E.A. Viscount on June 18 was the promise of disciplinary action against the Greek pilot who is stated to have flown within 30 yd of the aircraft. Subsequently, however, it was reported that the Viscount pilot, Capt. John Klimcke, had been charged in his absence by an Athens court with infringement of the "law regulating air communications."

* * *

A.T.A. announce that an airline representatives committee is to be appointed to discuss an aircraft proximity warning indicator with qualified electronics companies. The device is intended to inform a pilot of the position of another aircraft in relation to his own, and the airline industry will specify equipment that would tell a pilot what evasive action to take, or could perform this action automatically if collision is imminent.

The West's best at Vnukovo, Moscow, on June 29. As recorded in last week's issue, the Viscount brought back the industry delegates who had been visiting Russia. The R.A.F. Comet 2, which flew the Government and Service delegates, revisited Moscow on July 3 to carry out the postponed demonstration flight.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

Alighting from a Transport Command Comet 2 at Hatfield on their return from Moscow are Air Marshal Sir Thomas Pike, Deputy Chief of the Air Staff, Col. Konstaninov, Soviet Air Attaché in London, and A.Cdre. A. R. D. MacDonell, British Air Attaché in Moscow.

No. 29 Squadron Standard

THE Chief of the Air Staff, Air Chief Marshal Sir Dermot Boyle, will present the Standard to No. 29 Squadron at R.A.F. Station, Tangmere, Sussex, on July 18.

No. 29 was a day fighter squadron on the Western Front in the first war, and one of the most successful home-defence night fighter squadrons in the second. It still operates in the night fighter rôle, and is equipped with Meteors. The present commanding officer is W/C. J. A. C. Aiken. The Battle Honours embroidered on the Squadron Standard are: Western Front, 1916-1918; Somme, 1916; Ypres, 1917; Somme, 1918; Channel and North Sea, 1939-1940; Battle of Britain, 1940; Home Defence, 1940-1945; France and Germany, 1944-1945.

No. 29 Squadron was formed in November 1915 and went to France the following March as one of the first single-seat fighter squadrons, with the task of helping to combat the "Fokker scourge." It was equipped with the D.H.2. Among the squadron pilots during the early months in France were Lt. Henry Segrave, later to receive a knighthood for his land and water speed record achievements, and F/Sgt. J. T. B. McCudden, who became one of the leading British fighter pilots. McCudden shot down his first enemy aircraft and won the Military Medal and Military Cross with No. 29 Squadron. On a later operational tour with No. 56 Sqn. he won the Victoria Cross. In March 1917 the squadron re-equipped with Nieuports and a year later with S.E.5as which it kept until the end of the war. It was engaged on low-level fighter-bomber work as well as "dog-fighting," and at the close of hostilities had claimed the destruction of more than 220 enemy aircraft and balloons.

At the start of the second war No. 29 Squadron was based at Debden, Essex, equipped with Blenheims. During the early months it was engaged on routine patrol work and claimed its first enemy bomber destroyed in May 1940. At the end of the year the squadron started to receive Beaufighters and the number of successes increased. One of the flight commanders during this period was S/L. Guy Gibson, later to win the Victoria Cross for leading the raid against the Ruhr dams. Gibson won a bar to the D.F.C. while serving with No. 29 Squadron at West Malling, Kent, the citation stating that he had destroyed three enemy aircraft and damaged a fourth. Although enemy night bomber activity declined from the spring of 1941, No. 29 Squadron achieved outstanding results on several occasions. In October 1942 during a "Baedecker" raid on Canterbury it shot down four Dornier Do 17s. In January 1943 when a force of about 50 enemy bombers attacked London, No. 29 Squadron shot down seven of them. Among leading night-fighter pilots who flew with No. 29 were W/C. C. M. Wight-Boycott, who destroyed four enemy aircraft in one night, and S/L. J. R. D. Braham whose "score" with the squadron was 13.

In the summer of 1943 Mosquitos replaced the Beaufighters, and in 1944 night intruder operations over the Continent were undertaken. After D-Day many sorties were flown over the Normandy beach-heads. Later the Squadron mounted patrols against the flying-bombs and attacked launching sites. After the war No. 29 Squadron went to its present base at Tangmere and in 1951 became the first night fighter squadron to be equipped with Meteor NF.11s.

Sabres Replaced

THE last of the North American F-86E Sabres, which have been in squadron service with the R.A.F. since 1953, have now been replaced by Hunters, delivered from an off-shore procurement contract placed by the United States Government in the United Kingdom. Between 300 and 400 F-86E Sabres were supplied to the R.A.F. from Canada in 1952 and 1953, under a joint United States/Canadian mutual aid arrangement, and further Sabres were provided by the United States early in 1953.

In all twelve R.A.F. squadrons were equipped with Sabres. They logged an aggregate of over 120,000 flying hours—representing a distance covered of 48 million miles at a cruising speed of 400 m.p.h. The first squadron—and the last—to fly Sabres—was No. 3 based at Geilenkirchen, Germany, and commanded by S/L. T. H. Hutchinson. No. 3 Squadron—which recently celebrated its 43rd anniversary of continuous service—received its first three Sabres on May 12, 1953. Seven of the original aircraft were with the squadron until this month, the oldest (XB 590) having completed more than 800 flying hours.

"Becher's Brook" was the name given to the transatlantic ferrying operations which brought the Sabres from Canada. The aircraft flew from Quebec *via* Goose Bay (Labrador), Bluie West (Greenland), Keflavik (Iceland) to Prestwick, a distance of nearly 3,000 miles, then on to R.A.F. Maintenance Units. The ferrying was undertaken by No. 147 Squadron, Transport Command (originally designated No. 1 Long Range Ferry Unit). Despite the inhospitable route and at times severe weather the operation ran to schedule and with very few losses. Trips varied in duration from three weeks to only two days, according to weather, but actual flying time for the journey averaged six-and-a-half hours.

Vulcan for Australia

THE Air Ministry announce that an Avro Vulcan of R.A.F. Bomber Command will participate in the Air Force commemoration week ceremonies in Australia in September. The invitation to send the Vulcan was made by Air Marshal Sir John McCauley, Chief of the Air Staff, R.A.A.F.,

(Left) Freddie the Fox, new mascot of No. 12 Squadron, seems content enough in the care of F/O. Frank Booth. F/O. Booth is thanking Sir James Ritchie, chairman of the Battersea Dogs' Home, who handed Freddie over.

(Right) F/O. Ken Bassett and one of the mascots of No. 151 Squadron, needless to to say a night fighter unit (present equipment Venoms).

SERVICE AVIATION . . .

to Air Chief Marshal Sir Dermot Boyle, Chief of the Air Staff, R.A.F. Two Vickers-Armstrongs Valiants, the first of the V-bombers to enter service, visited Australia last September.

The Masefield Trophy

THE flying club of No. 47 Squadron, based at R.A.F. Station, Abingdon, Berks, has tied with the Cambridge Private Flying Group in the competition sponsored by the Popular Flying Association for the Masefield Trophy. The trophy is awarded to the most efficient group affiliated to the Association, and particular emphasis is placed on safety in flying operations. Seven clubs entered the competition. No. 47 Squadron will hold the trophy for six months, and the Cambridge Club for the remainder of the year.

No. 47 Squadron flying club was formed in 1954 and logged 340 hours' flying last year. This year its Tiger Moth has flown 160 hours to date. Piloted by the Squadron Commander (S/L. D. P. Boulnois) it has done well in the National air racing championship, its present placing being second. It is due to compete in the Kemsley Trophy race at Baginton on July 22. Many of the 30 club members are ground tradesmen, who take full advantage of the very low charge for flying instruction—27s 6d an hour. To date the club has trained 22 pupils to the "solo" flying stage, six having gained their private pilot's licence.

R.A.F. College Association

WITH the object of strengthening the links between past and present members of the R.A.F. Flying College, a College association has been formed and A.V-M. A. McKee has consented to become its first president.

Membership is open to all holders of the p.f.c. symbol and to staff officers who have been closely associated with the instructional work of the Flying College. The Association is particularly anxious to get in touch with American and Dominion officers, and with R.A.F. officers serving overseas who qualify for membership.

Further details can be obtained from the Honorary Secretary, R.A.F. Flying College Association, Manby, near Louth, Lincs.

Royal Air Force Appointments

THE following continues a list of Royal Air Force appointments announced by the Air Ministry:—

G/C. S. W. Needham to R.A.F. Quedgley, to command; G/C. J. B. Altham, C.B.E., to H.Q., No. 27 Group, for air staff duties; G/C. R. H. C. Brousson, O.B.E., to H.Q., No. 61 Group, for technical staff duties (retaining the acting rank of group captain).

W/C. L. D. Mavor, A.F.C., to the R.A.F. Staff College, Bracknell, for directing staff duties (with acting rank of group captain); W/C. F. H. Shutt to R.A.F. Stafford, to command (with acting rank of group captain); W/C. J. J. K. Fleetwood, D.S.O., to R.A.F. Topcliffe, for flying duties; W/C. A. M. Montagu-Smith to H.Q., No. 22 Group, for administrative staff duties; W/C. M. Booth, D.F.C., to Ministry of Supply; W/C. N. Cameron, D.S.O., D.F.C., to command University of London Air Squadron; W/C. I. J. Spencer, D.F.C., to H.Q., 2nd Tactical Air Force, for air staff duties; W/C. C. H. Baker to H.Q., Home Command, for air staff duties; W/C. G. A. Fricker to Ministry of Supply; W/C. G. J. Symonds to H.Q., Home Command, for air staff duties; W/C. A. Ruda to Air Ministry, for duty in the Department of the Air Member for Personnel.

W/C. P. H. Legg to H.Q., Middle East Air Force, for administrative staff duties (with the acting rank of group captain); W/C. R. A. Roy, O.B.E., to H.Q., No. 13 Group, for technical staff duties (with the acting rank of group captain); W/C. J. O. Barnard, O.B.E., to H.Q., Transport Command, for air staff duties; W/C. I. B. Butler, D.F.C., A.F.C., to R.A.F. Wunstorf, for flying duties; W/C. G. Goodman, M.B.E., D.F.C., to Ministry of Supply; W/C. E. James, D.F.C., A.F.C., to R.A.F. West Raynham, for flying duties; W/C. I. G. MacKay to H.Q., Allied Air Forces Northern Europe, for staff duties; W/C. R. R. Mitchell, M.B.E., D.F.C., to R.A.F. Acklington, for administrative duties; W/C. T. R. Pierce to R.A.F. Watton, for flying duties.

W/C. A. G. Sollis to H.Q., No. 23 Group, for technical staff duties; W/C. R. F. Sparrow to H.Q., Allied Air Forces Central Europe, for staff duties; W/C. E. W. Tacon, D.S.O., M.V.O., D.F.C., A.F.C., to Air Ministry for duty in the Department of the Air Member for Personnel; W/C. G. H. Wass to H.Q., Maintenance Command, for technical staff duties; W/C. P. A. McWhannell, O.B.E., to R.A.F. Kenley, to command; W/C. V. C. Woodward, D.F.C., to R.A.F. Jever, for flying duties; W/C. H. F. White, D.F.C., A.F.C., to R.A.F. Odiham, for flying duties; W/C. G. L. O'Hanlon, M.B.E., to Air Ministry, for duty in the Department of the Air Member for Supply and Organization (with acting rank of group captain); W/C. R. P. Burton, M.B.E., to R.A.F. Felixstowe, to command; W/C. B. J. Bushe-Caryesford to No. 4 M.T. Squadron, R.A.F. Kidbrooke, to command; W/C. H. C. Fleming to H.Q., Home Command, for administrative staff duties; W/C. G. L. Smith to H.Q., Provost and Security Services, for administrative staff duties (retaining acting rank of wing commander).

A "Flight" photograph of the Blackburn and General Aircraft Beverley C.1 of No. 47 Squadron, R.A.F. Transport Command, which was recently the photographic vehicle for the pictures on pages 88-93. It is seen in company with a Javelin FAW.1 of No. 46 Squadron.

Reunions

THE reunion dinner of No. 115 Sqn. Association will be held at 7 p.m. on October 20 at Letley's Restaurant, Chancery Lane, London, W.C.2. Dress will be lounge suits; lady guests will be welcome and tickets will cost about 15s 6d. Details from Mr. P. G. Williams, 111 Burton Road, London, S.W.9.

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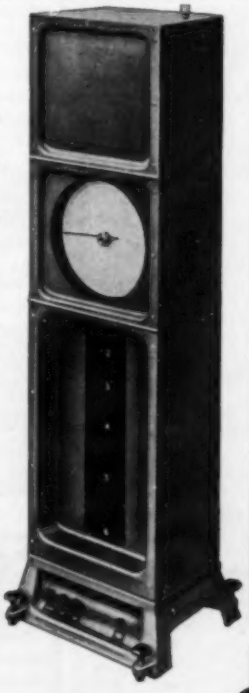

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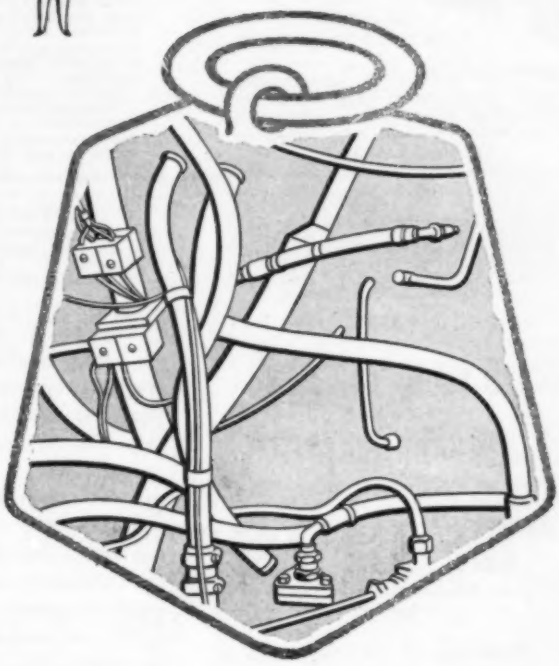

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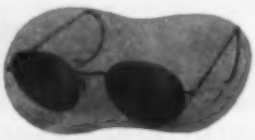

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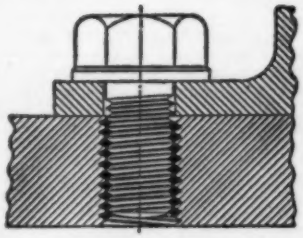

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PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE AIR TRANSPORT ADVISORY COUNCIL give notice that they have received the undermentioned applications to operate scheduled air services:

APPLICATION No. 298/2 from Silver City Airways, Ltd., of 1 Great Cumberland Place, London, W.1, for an amendment to the terms of approval of the All Freight Service which they are approved to operate until 30th November, 1959, between London (Blackbushe), Lydd or Southampton (Eastleigh) on the one hand and Calais, Le Touquet, Lille, Metz, Gros Tenguin, Ostend, Brussels, Liege, Charleroi, Antwerp, Luxembourg, Eindhoven, Ypenburg, Leeuwarden, Twente, Amsterdam, Hamburg, Bremen, Hanover, Cologne, Dusseldorf, Frankfurt, Gutesloh, Buckeburg, Wildenrath, Copenhagen, Malmo and/or Basle on the other hand, so as to be permitted to operate at their discretion direct flights between the United Kingdom and any authorised Continental traffic point and to serve any number of authorised traffic points on any flight.

APPLICATION No. 160/2 from Eagle Aviation, Ltd., of Marble Arch House, 32-50 Edgware Road, London, W.2, for amendments to the terms of approval of the All Freight Service which they are authorised to operate until 31st August, 1960, so as to operate with Viking and Dakota aircraft on the amended route Manchester and/or Birmingham-Amsterdam and/or Dusseldorf or Frankfurt and/or Berlin-Copenhagen-Stavanger and/or Oslo-Stockholm and/or Gothenburg-Copenhagen-Berlin and/or Frankfurt or Dusseldorf and/or Amsterdam-Birmingham and/or Manchester.

FROM Dragon Airways, Ltd., of Woolsington Airport, Newcastle-on-Tyne:

APPLICATION No. 803. For a Normal Scheduled Service to be operated with DH. Heron aircraft for the carriage of passengers, supplementary freight and mail between London Airport and Rotterdam at a frequency of from 7 to 14 return flights per week for a period of 10 years from the date of approval.

APPLICATION No. 804. For a Normal Scheduled Service to be operated with DH. Heron aircraft for the carriage of passengers, supplementary freight and mail between Newcastle and Dusseldorf with an intermediate traffic stop at Rotterdam at a frequency of from 3 to 7 return flights per week for a period of 10 years from the date of approval.

APPLICATION No. 805. From Air Kruise, Ltd., of 1 Great Cumberland Place, London, W.1, for a Normal Scheduled Service to be operated with Dakota, Bristol 170 and later Handley Page Herald aircraft, for the carriage of passengers, supplementary freight and mail between Lydd and Luxembourg (Sandweiler) at a frequency of one to 10 return flights daily for a period of 10 years from the date of approval.

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on 30th July, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [5494

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